HEROES *of* PROGRESS



EVA MARCH TAPPAN

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HEROES OF PROGRESS

Stories of Successful Americans

By Eva March Tappan

"HEROES OF PROGRESS" presents to children some thirty great men and women of the last fifty years who represent the finest qualities of American achievement in invention, discovery, and exploration, art, music, philanthropy, kindness to animals, industrial success, aviation, pure and applied science, etc.

It is hard to imagine a book that would more keenly stimulate the best in the development of the child, or one more likely to make an impression for good in the most impressionable years.

HEROES of PROGRESS



EVA MARCH TAPPAN

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HEROES OF PROGRESS

STORIES OF SUCCESSFUL AMERICANS

BY EVA MARCH TAPPAN, Ph.D.

Author of

"THE FARMER AND HIS FRIENDS," "DIGGERS IN THE EARTH"
"MAKERS OF MANY THINGS," "TRAVELERS AND TRAVELING"
"OUR EUROPEAN ANCESTORS," "AMERICAN HERO STORIES"
"AN ELEMENTARY HISTORY OF OUR COUNTRY," ETC.



HOUGHTON MIFFLIN COMPANY

BOSTON · NEW YORK · CHICAGO · DALLAS · SAN FRANCISCO

The Riverside Press Cambridge

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The Riverside Press
CAMBRIDGE · MASSACHUSETTS
PRINTED IN THE U. S. A.

PREFACE

THIS book is planned to give as general a view of recent American achievement as possible without becoming of unwieldy size. Invention, discovery and exploration, art, music, philanthropy, kindness to animals, industrial success, aviation, pure and applied science, are all represented. To select the names of the men and women of achievement has not been easy. Some thirty have been carefully chosen with the aim of introducing those whose work reached its consummation within the last half-century; but in a few instances men have been included whose inventions have been greatly developed in recent years, even though by other hands.

In making the selection a number of "children's librarians" have been consulted, with the wish to include as many as possible of the people about whom children come to them for information. There is seldom difficulty in finding biographies of authors, soldiers, or statesmen. For this reason such names have been omitted from this book.

The qualities which led these men and women to success have been brought well to the front; and while financial rewards have often been mentioned, success is reckoned in value to the world, rather than in money acquired by the individual.

As far as feasible these biographies have been

submitted to some member of the family of each person introduced. For the kindness and helpfulness of these critics I am glad to take this opportunity to express my deep sense of obligation.

In writing these sketches it was necessary, of course, to depend for facts chiefly upon volumes of biography or of letters. To the authors of such volumes and to the editors of the many autobiographies and reminiscences which I have used, I am also sincerely grateful.

EVA MARCH TAPPAN

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HEROES OF PROGRESS

JOHN JAMES AUDUBON

LOVER AND STUDENT OF BIRDS

1780–1851

1827–1830, published the *Birds of America*

EARLY in the seventeen-seventies, Commodore Audubon, of the French navy, came to Louisiana on business. He married, then returned to France, where his son John James Audubon was born. Commodore Audubon had bought a plantation on St. Domingo, which soon needed his attention; so the little family sailed for the island. In a slave insurrection the mother perished, but the baby was saved. Father and son went back to France.

The father married a second time, then came to America to join Lafayette and help the colonists to win the Revolutionary War. The child was left in the care of his stepmother, who idolized him. She filled his pockets with money, she bought him the finest clothes, she gave him full permission to buy whatever he chose in all the candy stores of the place, and she often told him that he was the handsomest child in France. As for school, he went when he liked, but when he did not like, he wandered off into the fields and woods.

When the father returned, he found his son's

room full of odd stones, birds' nests, curious lichens, and pressed flowers, and he was pleased; but when he learned that the boy had done nothing but make collections, he marched him off to the place where he himself was stationed, and saw to it that he did some real studying. Nevertheless, the boy loved nature, and especially birds, as much as ever, and somehow he found time to make drawings of some two hundred of the birds of France. "All bad enough," he said afterwards, "yet I felt pleased with them."

While Commodore Audubon was in America, he had bought an estate near Philadelphia; and before many years had passed, he sent his son across the ocean to manage it. The young man had a delightful time with hunting, fishing, drawing, and music. He was strong and handsome and graceful, always dressed with the utmost care, and with such winning, friendly manners that his neighbors were all devoted to him. His rooms were museums of eggs, and paintings, chiefly of birds, for they still held the first place in his interest. He must have been rather a queer manager of an estate, for he was so little of a business man that he once put eight thousand dollars into an envelope and mailed it without remembering to put on a wafer.

It was hardly a wise move for such a man to open a store; but he and his bride of one day and a friend who was to be his partner went through the woods and down the Ohio River to Louisville, Kentucky. There and elsewhere they "kept store"; that is, the

partner managed the store, while Audubon had a glorious time roaming through the forests, collecting and painting birds.

This rather peculiar fashion of carrying on a mercantile life lasted for some ten years. He and his wife's brother attempted trade in Henderson, Kentucky; they built a sawmill; and they bought a steamer. Nothing succeeded, the money left to Audubon by his father soon vanished, and he ceased to be a business man. As he said, "I parted with every particle of property I had to my creditors, keeping only the clothes I wore on that day, my original drawings, and my gun, and without a dollar in my pocket walked to Louisville alone."

He was so sad that, as he went through the woods, even his precious birds looked to him like enemies. But his wife and children he loved with his whole heart, and for their sake he set bravely to work drawing crayon portraits. He took a position in a museum in Cincinnati, but his salary was not paid. He was longing to publish his bird drawings, but first he must add more of the Southern and Western birds. So he went South, paying his way by drawing portraits and teaching drawing. He paid for a pair of shoes by sketching the shoemaker, and for his passage on a boat by painting the walls of the cabin.

His wife believed firmly in her husband's genius, and she was as eager as he to have his work published. Moreover, she had the business ability which he lacked. She had earned a goodly sum teaching,

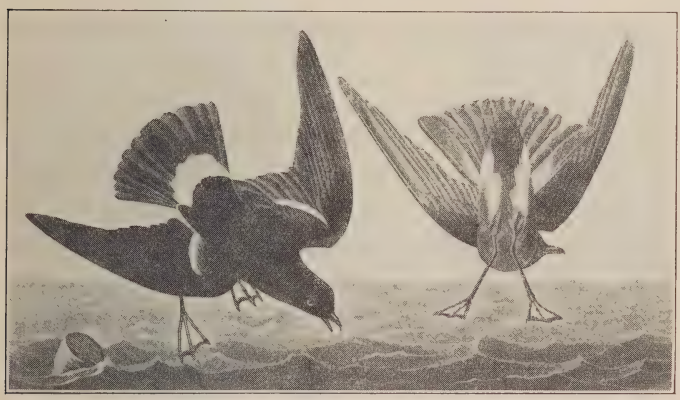
he added to it by giving dancing lessons, and in 1826 the way was clear for him to go to England.

England was entirely new to him, and he was rather aghast at spending five hours at dinner. He was never awkward, but he was sensitive, and so modest that he was always grateful to people who made him feel at home. The object of his journey was to gain subscribers to his proposed *Birds of America*. His drawings were put on exhibition; and now came a hard time for the artist. A word of appreciation made him blush with joy, but when he overheard some one in a crowd say, "I have seen them; save your shilling for better use," he dared not raise his head, but wished himself back in the American forests with his birds. Once when he was standing just outside the door of his exhibition, a stranger asked him if those pictures were worth seeing. The artist said "No" most emphatically, and the man turned aside. He asked the same question of some one else, and this second man must have said "Yes," for he came back and went in.

After a time in England, Audubon went to Scotland, and there he was as eager to see Sir Walter Scott as to make friends for his books, and one night he went to sleep with his favorite of Scott's novels under his pillow, hoping for a dream of its author. At last the happy time arrived for an interview. A friend came into his painting room and said, "Put on your coat and hat and come with me to Sir Walter Scott; he wishes to see you

now." "I really believe my coat and hat came to me instead of my going to them," Audubon wrote in his journal. Sir Walter was very cordial, and the naturalist went away from the call as sincere a worshiper of the novelist as in the days of his early manhood.

Occasionally Audubon had a disagreeable interview. One man of high rank, not a subscriber,



STORMY PETREL

Drawn from nature by J. J. Audubon and printed in colors in *Birds of America*. The original illustration is 16½ x 12¼ inches.

actually sent for him to call, and then told him scornfully that his birds were all alike, and the work was a swindle. Audubon made no reply, but bowed and left the house. He wrote quietly in his journal, "It is not the custom to send for a gentleman to abuse him in one's own home." He was elected a member of various scientific societies, and met many men of great learning. He met one

banker, who was most courteous, but who declared that he knew nothing of ornithology except that large feathers were called quills, and were useful in posting ledgers. All this he noted down in a journal, which is really one long homesick letter to his wife in America. He tells her of every discouragement that he meets, and he writes just as frankly, "Now, my Lucy, . . . I may feel proud of two things, that I am considered the first ornithological painter and the first practical naturalist of America; may God grant me life to accomplish my serious and gigantic work."

Audubon now went to France in the hope of increasing the number of names on his list of subscribers. He had the pleasure of meeting Cuvier often, and the great scientist declared to the Academy of Sciences that the *Birds of America* was the most magnificent monument which had yet been erected to ornithology. Nevertheless, there were fewer in France than in England who could afford to spend a thousand dollars on a set of books, and not many new subscribers were gained.

The months in Europe were by no means a time of idleness. It was Audubon's business to meet as many people — possible subscribers — as he could; to secure engravers, and also painters who could color his engravings properly; and to attend to the whole business of publishing his plates. Business was always troublesome to him, and he wrote to his wife, "It is difficult for a man like me to see that I am neither cheating nor being cheated." Then,

too, he had many orders for pictures, and he often painted twenty hours out of the twenty-four. It is no wonder that he was happy when at last he had arranged his business affairs and was free to sail for home in the packet-ship which he chose because of her name, *Columbia*.

A year later Audubon and his wife went to Edinburgh. Here Audubon set to work to write his *Ornithological Biography*, which is really charming accounts of the lives and habits of his birds, and where he had found them. "Your father is up and at work before dawn, and writes without ceasing all day," Mrs. Audubon wrote to the sons.

To bring out the *Birds* took not only hard work, but a vast amount of perseverance and courage. It was planned to be issued in eighty-seven parts of five plates each, giving 1065 figures of birds. The text came out separately, in five large octavo volumes. Only a few numbers were to be brought out each year, and the publication was to extend over a number of years. It is not strange that even after subscribing, some fifty persons withdrew their names.

The Audubons returned to America, and then they literally followed the real living birds. The whole family journeyed together in most delightful fashion. Where there were birds that the naturalist wished to draw, they stopped; where there were none, they went on. His charming manner made friends for them everywhere.

Audubon had long wished to make a trip to

Labrador to study the Northern birds, and in 1833 he, his youngest son, "Johnny," and four other young men, chartered a schooner and set sail. One of them wrote of their leader, "You had only to meet him to love him, and when you had conversed with him for a moment, you looked upon him as an old friend, rather than a stranger."



REPUBLICAN CLIFF SWALLOW

Drawn from nature by J. J. Audubon and printed in colors in *Birds of America*. The original illustration is 16½ x 12¼ inches.

In 1840 the family made their home in Audubon Park, as it is now called, within the present limits of New York City. The sons had married, and here eleven of the fourteen grandchildren were born. Audubon must have been a most lovable grandfather, for he never objected to as many of the children as might choose making use of his painting house as a playroom.

A smaller-sized edition of the *Birds* was to be prepared, and Audubon had also planned *Quadru-*

peds of North America. Father and sons worked together on what they called "our book." The father sketched, one son, using the *camera obscura*, reduced the drawings to the required size, and the other son attended to printing and publishing. Audubon was very happy in his youngest son's success in painting. "Ah, Johnny," he would say, "no need for the old man to paint any more when you can do work like that."

To the last day of his life he was the same gentle, lovable person that he had always been. He loved to wander along the banks of the Hudson River. "The love of animals develops the better side of all natures," he said, and he loved all animals, but especially birds. Birds have been hunted for their flesh, their plumage, and even for the amusement of trying to hit them. There is a story which pictures a man throwing open his blinds in the morning and exclaiming, "Beautiful day! Let's go and kill some birds!" To prevent this destruction of bird life the Audubon Society has been formed, rightly named for the man who did more than any other person to interest people in birds and their ways. President Roosevelt was deeply interested in saving the birds, and set apart fifty-three different areas of land as "bird reservations." These reservations are located in many parts of the United States, along the ocean coast, in Nebraska and South Dakota, in Oregon, California, and on the Hawaiian Islands. No one is allowed to enter them who will harm or disturb the birds, and to some of them all

entrance is forbidden. Birds are quick-witted, and they soon understand where they are safe. It is a pity they cannot understand that their safety is due to Audubon, friend of their fathers.

MARK HOPKINS

PRESIDENT OF WILLIAMS COLLEGE

1802–1887

1836, became President of Williams College

If Mark Hopkins's family had known that he was to become a famous college president, they would surely have taken notes of his sayings and doings. As it is, only two stories have come down to us of his early days. In one tale he entered school at the age of four, book in hand. "And where can you read?" the teacher asked; and the little fellow gravely replied, "Just where you please, sir," which proved to be correct. The other event occurred when he himself was teaching, not so many years later. One of his pupils treated some young birds cruelly, whereupon the president-to-be boxed his ears soundly.

Teaching and studying by turns, he entered Williams College as a sophomore. The following year he wrote a prize oration on the rather tremendous subject, "Modern Chemistry — Revelation Confirmed by its Discoveries." His valedictory, a year later, was on the even more overpowering theme for an inexperienced youth of twenty-two, "The Formation of a Practical rather than a Speculative Character by Literary Men."

Only one college prank is recorded of him, and that was somewhat scholarly. He presented an

essay, half of which was original and the other half copied from a distinguished Scotch author. He mischievously put his own half in quotations, but gave none to the other author. Either the student's work was remarkably good, or else the young professor was not very well up in the subject, for he praised the original part and was savagely critical of the writings of the learned Scotchman. Mark Hopkins was very gentle with the professor, for he told the secret to only one friend, and for half a century the friend kept his promise not to reveal it. Three years later Hopkins himself became a tutor in the college; but there is no record that he was ever caught in the same — or any other — way.

After taking his master's degree, he studied medicine, and was on the point of going to New York to practice, when, unexpectedly to himself, he was asked to become Professor of Mental and Moral Philosophy and Rhetoric at Williams. In these days no one would be invited to teach a subject unless he had made special preparation in that line; but at that time, if an educated man had shown that he could teach one subject, he was expected to be able to teach another as a matter of course. Then, too, this young physician had shown sincere interest in the branches which he was asked to teach. One point of preparation, however, could not be passed over; there was a general feeling that one who was to instruct young men ought to have a theological education; therefore the professor-to-be packed up his medical books and for three years he

studied theology and kindred subjects. He was now licensed to preach, he married, and he took his place as a member of the college faculty.

Three years later, in 1836, the president resigned. The trustees spoke of Professor Hopkins as his successor, but decided that he was too young. Just at the critical moment — and probably after careful planning — a letter was presented to the Board from the class graduating that year. It thanked the trustees most suggestively for the great privilege of having had Professor Hopkins as their instructor. This turned the scale. "If the boys want him," declared one of the trustees, "let them have him"; and they had him.

In 1836 the president of a college was expected to have a much closer connection with the students than would be required "to bow in one company and bow out another." He must act as parent and guardian to every boy, and be to each one a personal friend and adviser. He must represent the dignity of the college, be equal to all emergencies and all difficulties. Besides this, he was expected to do an amount of teaching that would whiten the hair of a twentieth-century professor.

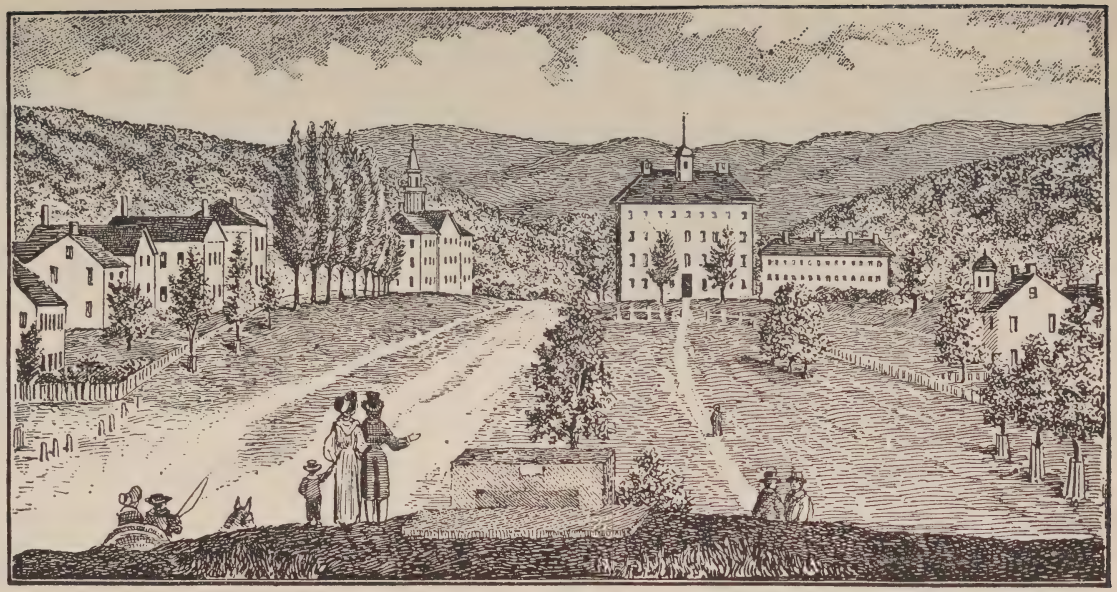
One of the prevailing notions of the time was that a man of intellect should be quite superior to the whims of the body, and that it was indeed hardly in good taste for a scholar to pay much attention to his food or his health. But President Hopkins was also *Doctor* Hopkins, and his first teaching to the seniors consisted of lessons in anatomy, and physi-

ology, and from these he developed the study of the mind.

To teach physiology he needed a manikin, but one would cost six hundred dollars, and he did not feel that the college could afford to spend that amount. So he mortgaged his own salary for six months and gave his note for the "little man." To pay for his pasteboard treasure he gave lectures on physiology in Stockbridge and elsewhere.

The lectures were a great success. "There never was anything that took so well," one friend wrote him. Another said: "Dr. Hopkins has given a fine blow to our vanity. Whenever I see a fine countenance and a graceful person, I shall only think the possessor has a particularly well-disposed set of muscles under his command." Some months later the trustees took over the manikin and canceled the note.

To the entering freshmen of each year President Hopkins taught the laws of health. He advised them to saw their own wood, to learn to enjoy fine prospects, and to tramp over the hills in quest of minerals and flowers. He also taught metaphysics and ethics and rhetoric. He corrected compositions and criticized declamations. He was pastor of the college church and preached almost every Sunday. Saturday forenoons he taught the senior class the Assembly's "Shorter Catechism" for half an hour; and he made it so unbelievably interesting that more than one class asked to have the time lengthened to an hour and a half.



AN EARLY VIEW OF WILLIAMS COLLEGE

Of the two buildings with cupolas the one at the right (four stories) is the original college building — College West; the one to the left (three stories) is Griffin Hall, built in 1828.

Besides all this teaching he was writing, delivering important addresses and baccalaureate sermons. He not only taught the students how to grow mentally, but he himself was growing, and they saw it. They respected and reverenced him. In his classes there was absolute freedom of discussion. As long as a boy was in earnest and was trying to express a real thought, the President would listen attentively; but if he was only talking to hear his own voice, the President would turn the laugh on him effectively, but so good-naturedly that his feelings did not suffer any serious damage. In the catechism class he was once talking of the Fifth Commandment, and he said that a school, being in the place of a parent, was entitled to the same obedience. One bright but rather restive boy objected to this at some length. When just the right moment came, President Hopkins raised a storm of applause by saying in a matter-of-fact tone, "Hence we see that a father who has an unruly son whom he knows not what else to do with is sure to send him to Williams College."

Dr. Hopkins was equally wise in what is still spoken of as the "rebellion of 1868." It seemed that some few students were frequently absent from their classes, and this interfered with the work. Now Dr. Hopkins did not believe in strict rules and penalties or in treating all students alike. "Some one must be at the foot of the class," he often said; and he thought that patience and kindness and the college influence would do more to make boys

manly than any rigid laws and penalties. Most of the faculty took the opposite position. They believed that the only way to lessen these absences was to treat offenders with severity.

At the faculty meeting it was decreed that every absence should be marked zero, but if attendance had been impossible, a professor might, if he chose, allow the work to be made up. The wording of this rule was made unnecessarily annoying, and the students were indignant. Then, too, they felt that "impossible" was a rather strong word, and that the new rule put it into the hands of any professor with a grudge to lower a student's standing seriously. They requested — almost demanded — that this new rule be annulled. When this was refused, they left the college. The faculty, perhaps a little too promptly, sent out circulars to the parents and the newspapers explaining the condition of things. Dr. Hopkins was in Ohio. It would have been much wiser not to make any new rules during his absence; but the rule had been made, and the burden of making peace rested upon him. What would he do?

He reached home Saturday night, and preached in the chapel as usual. On Monday, President, faculty, and students met. He made it clear that all students were still under college rule, and that if any wished to withdraw from college, they must return to their work and then ask for letters of dismissal, which would be granted. The faculty wish the best government possible, he declared, and

if the rule in hand is not the best rule possible, it can be changed. When the four o'clock classes met that afternoon, the students returned, though many answered the roll-call as "Present, under protest." "No student is in this college under protest,'" declared the President emphatically, and at the next roll-call there was no more 'under protest'; the tact of the President had brought the rebellion to an end. After the storm had blown over, the wording of the rule was changed.

President Hopkins was the author of several books. The most famous of these is *The Law of Love and Love as a Law.* Another eminent scholar wrote a review of it, and with a touch of what the students at Williams wrathfully looked upon as something like self-conceit, declared that Dr. Hopkins's reading seemed to have been limited to rather commonplace works. Dr. Hopkins quietly and courteously turned the tables by saying: "While I acknowledge fully the want of reading referred to — and regret it — I may be permitted to say that on this subject he has presented no point that I had not seen, and has raised no objection that I had not considered."

President Hopkins had many invitations to become pastor of prominent churches and professor in different theological seminaries; but he always declined, saying, "I dwell among mine own people." And the young men whom he taught were literally his "own people." In his classes there was always the frankest discussion, and he never attempted to

force his own views upon the students; but nevertheless the stamp of his mind was upon them. "All Williams men have a family resemblance," was declared many a time; and one graduate after another has ended his praises of the great teacher with, "Best of all, he taught me to think."

CYRUS H. McCORMICK

INVENTOR OF THE REAPER

1809–1884

1840, the first practical reaper was offered for sale

THE workshop on the McCormick farm in Virginia was a log house of one big room. Here were two forges, an anvil, a work-bench, and the various tools used in repairing or making the implements used on the farm. These were rude, slow-working implements, for the sod was turned with a ploughshare of cast iron; grass was mowed with a scythe; grain was cut with a cradle and threshed with a flail.

In this workshop the little Cyrus McCormick played and watched his father do all sorts of interesting things, working in wood and iron. One of the most wearisome parts of the year's work was harvesting the grain; and it is no wonder that the thoughts of the elder McCormick, a man of inventive ability, turned upon the possibility of making a machine to harvest it for him.

He produced one in 1816. It would not work, and the neighbors laughed at it. Perhaps even the horses were amused, for they found themselves expected not to pull it, but to push. After fifteen years more of work, he succeeded in making it reap fairly well, but it left the grain in as bad a tangle as if the witches had been at work on it. Several

other inventors had made machines that would do as well as this. He could not see how to improve upon them, and at length he gave up trying.

While the father was working and thinking and the neighbors were joking about his reaper, the boy Cyrus was growing up. He became a tall, strong, rather dignified young man, who led the singing in the church. He had studied surveying and had intended to be a surveyor, but he could not make up his mind to give up the reaper.

Now when grain was straight and firm, his father's machine would answer the purpose very well; so what the son had to do first was to invent a way to cut the stalks when they were tangled. His plan seems simple enough now, but it took brains to think it out. He merely put at the end of the knife a curved arm to separate the grain to be cut from the grain to be left standing. The knife he made to move backward and forward, so as not to miss any of the grain.

This was not all by any means, for some way must be contrived so that after the curved arm had separated the stalks, they would stand up until they were cut. This he managed by putting a row of fingers at the edge of the blade. To lift up the grain that had fallen on the ground, he made a revolving reel. To catch the grain as it fell, he made a platform; and instead of amazing the horses by making them push the machine, he arranged it so it could be pulled. Finally, he built the whole machine upon a big driving wheel; that

is, a wheel which receives the power and communicates it to the other wheels of the machinery.

The affair was clumsy. Would it reap? Cyrus and his father and mother and brothers and sisters all went to the wheat-field and stood watching in the wildest excitement. They were sure that "Cy's machine" would reap — and yet, would it? It creaked and grumbled, then started and set to work. It cut the straight wheat and it cut the tangled wheat. There was a family rejoicing, and Cyrus arranged to give a public exhibition to the neighbors who had laughed at his father's efforts.

Not far away was a six-acre field of oats. To reap it would have taken six men with scythes a whole afternoon. Cyrus and two horses and the reaper did the work in the same time. A year later one hundred or more people came together to see the machine perform. It performed, but not quite as the inventor had expected, for it slipped and slid and stumbled and jolted and behaved as badly as if imps of mischief were in every wheel. The field was rough and hilly, and no reasonable being could expect the machine to do its work well in such a place.

It was a rather crestfallen inventor who stood beside his horses that summer day; but a moment later a voice said: "Pull down the fence, young man, and cross over into my field of wheat. I'll give you a fair chance." This field was level, the machine worked well, and before sunset six acres had been reaped. A young girl who watched the

machine being drawn up the road said many years later, "I thought it was a right smart curious sort of a thing, but that it would n't come to much." The people who had laughed at the inventor had to



Courtesy International Harvester Company of America

McCORMICK'S FIRST SUCCESSFUL REAPER

This was invented in 1831 and patented in 1834. The machine embodied the following essential principles of the modern reaper — vibrating sickle-edged blade, fingers to hold the grain, reel, divider and platform to receive the grain.

admit now that he had succeeded. But of all the praises that were given to him, there was not one that pleased him so much as his father's quiet, "I am proud to have a son do what I could not."

In these days we are used to new inventions, and we get a little out of patience if some one does not produce machines for doing everything quickly and easily. In the boyhood of Cyrus McCormick, most work, especially farm work, was done by hand

with an accompaniment of backache. And as for the implements — why, many people were still using wooden ploughs and thinking that iron ones were a very doubtful innovation. How was a young man to persuade the farmers to buy, not a simple thing like an iron plough, but an expensive machine that might fail them after a season's use? He had read enough about inventors to know that, because they were not good business men, they often failed to get their proper rewards. He made up his mind to work and wait, but to hold on to that reaper until he had won appreciation and purchasers.

He had no money for advertising, and he set to work to make it by farming. For nine years he struggled. He gave an exhibition of the reaper at work, but the effect was much like that of the famous sermon to the fishes,

> "Much delighted were they,
> But preferred the old way."

Who knew how long the machine would keep in order? Money was scarce and labor was cheap. The farmers cheered when they saw it cut two acres of wheat in an hour, but they did not purchase.

Nine years was a long time to wait for a customer, but in 1840 a man came forward with fifty dollars and said that he wanted to buy a reaper. A few weeks later another and then a third came for the same purpose. One machine was sold; then the honest inventor said frankly that he had an idea

for improving his reaper, and he refused to sell any more until he had given it a trial. His heart was in that machine, and he would rather wait than sell one that was not as perfect as he could make it. There was one fault, which he was sure he could overcome, namely, when grain was damp the reaper cut unevenly and sometimes would not cut at all. He thought and experimented, and then simply made the edge of the cutting blade more sharply saw-toothed, and it worked.

Three machines were now at work in the Virginia grain-fields. The sales increased slowly, but so surely that McCormick set up a manufactory on the home farm. Everything might have been expected to go on smoothly now that there was a factory to make reapers, and customers to buy them; but there was another great difficulty to be overcome, namely, how were these reapers to be delivered? Railroads were few, and if a farmer in Illinois or Wisconsin, for instance, sent an order for a reaper, the machine had to be "carried in a wagon to Scottsville, then by canal to Richmond, reshipped down the James River to the Atlantic Ocean and around Florida to New Orleans, transferred here to a river boat that went up the Mississippi and Ohio Rivers to Cincinnati, and from Cincinnati in various directions to the expectant farmer." This method of delivery was so slow and uncertain that more than once a reaper reached its purchaser long after his grain had all been harvested by hand.

Something must be done. McCormick set out into the world for the first time and went West. He saw prairies, flat, limitless, and of rich soil. He saw wide fields of grain without any one to gather it in. Here was the place for the reaper. Virginia as the home of grain began to look small to him. His reaper would be most at ease on these wide prairies, but how could prairies and reapers be brought together? There is an old proverb, "If the mountain will not come to Mahomet, then Mahomet must go to the mountain." The prairies would not come to the reapers, so the inventor set out to find a way to carry the reapers to the prairies. The best way was not to carry them at all, but to manufacture them at some central point as near as possible. Where should that point be? Wise man that he was, he decided upon a muddy little city named Chicago. It was a cheerless little place, without gas or sewers or pavements; but more grain passed through it than through any other city in the United States. Here McCormick built his factory in 1847.

His inventive ability and his perseverance had brought him thus far, and he acted on the principle of all good salesmen; that is, he looked at things from the buyer's point of view. He gave with every machine a written guarantee, that if it did not prove capable of reaping one and a half acres of grain an hour, he would refund the money paid. He trusted farmers and new settlers freely, and rarely lost by them. He advertised much by having

public trials, free to everybody, between his reaper and any others that had been invented, for there were scores of them now.

But a patent lasted for only fourteen years, and the time was up. He had spent a large part of this time not in making money from the reaper, but in improving it, an especially difficult thing to do, because he had only the short harvest season



Courtesy International Harvester Company of America

MODERN GRAIN HARVESTING MACHINES, COMBINING A BINDER AND A REAPER

They are drawn by a gasoline tractor.

for testing any new arrangement. Many factories were making and selling his reaper and paying him no royalty. Would Congress extend his patent, as had been done in several other cases? Of course the manufacturers united against him, and Con-

gress refused. Then McCormick set to work to take care of himself. He made his reaper into a "reaper and binder," and he swept through Europe with his field tests and his victories.

He fought many lawsuits, for he would never give up when he was sure that he was in the right. One, which was not connected with the reaper, he fought for twenty-three years. Through the fault of a railroad the trunks of his family and himself were destroyed, and he sued the road for damages. From court to court the case went, and at last to the Supreme Court of the United States. The verdict was that the road must pay the value of the trunks and also the interest on the money for twenty-three years. "What makes you fight so hard over a small matter?" asked a friend. "My conscience," replied McCormick. "Some one must stand up for fair dealing."

He was always a hard worker. "Work — that is what life is for," he said. When he had a problem to solve he worked on it until it was solved, quite as if there were no such things as ordinary business hours in the world. Everything that he had to do must be done thoroughly and accurately. "Don't misspell words," he said to a younger brother. "Carry a dictionary as I do."

He was just as decided in his politics and his religious faith. "I am in politics," he said, "because I have to be in order to defend the principles that I stand by." He liked New York because it had "regular and good Presbyterian preaching." He

liked the flowers that used to grow in his mother's garden in Virginia; and his devotion to her and to his father never faltered. When his father died he wrote to his brother, "Many a sore cry have I had as I have gone around this place and found no father." His wife was his trusted business adviser. When Chicago burned, in 1871, and his factory was destroyed, he asked her counsel whether to rebuild or retire. She thought of saving the business for their sons and said "Rebuild"; and while the ashes were still warm, he gave orders to put up a larger factory than the old one had been.

Before long there was more wheat coming in than the old-style mills could grind. Steel rollers began to take the place of stones. Great mills were built for making flour; one in Minneapolis is so large that it can turn out fifteen thousand barrels of flour every twenty-four hours. This is what the McCormick reaper has made possible in helping to feed a hungry world.

CHARLES GOODYEAR

A MAN WHO PERSEVERED

1800–1860

1844, first patented the vulcanization of rubber

In the early part of the nineteenth century rubber was used in this country for little else than erasing pencil marks. People were beginning to be interested in it, however, because it had such remarkable qualities. It was elastic and it was waterproof; it could be baked, soaked in lye or oil or turpentine without injury; neither mouse nor moth would touch it. The natives of the lands where it was produced made rough clay lasts, dipped them into the rubber juice many times, smoking them after each dipping, then broke up the lasts, and they had waterproof shoes. Why could not this be done in the United States?

People went wild over the possibilities of rubber. It cost only five cents a pound, and a pair of rubbers — gums, or galoshes, they were called — would sell for two or three dollars. Here was a chance to make a fortune, if a man was only wide-awake enough to seize the opportunity and invest. In 1833 six or eight factories were opened, and the manufacture of overshoes and wagon-covers, overcoats, caps, and life-preservers flourished.

These articles were sold as fast as they could be made; but when warm weather came, they were

returned as fast as their purchasers could bring them back. This rubber had one great fault; it proved to be hard as a rock in the winter and soft as chewing gum in the summer; and the overshoes made in the factories were not nearly so good as the clumsy ones made by the natives of the rubber countries. A pair of rubbers left by the fire would quietly melt away with a very, very bad odor. The only way to use such articles seemed to be to make one's home where there was neither heat nor cold.

Now in Connecticut there lived a man who was trying to solve the problem. God would not have put into the world a substance of such value unless he had meant men to find out how to use it; so this Mr. Goodyear reasoned; and he was convinced that the deep interest which he felt in rubber was a proof that he was meant to be the one to find out how to make the substance of use. He was a poor man, he had failed in business, and he had a wife and seven children. He knew little of chemistry, and had not so very much more than the average Yankee's talent for "fixing things" and improving them, but he began to experiment on rubber. He borrowed money and made hundreds of pairs of overshoes, very good-looking ones. But "Handsome is as handsome does," says the old proverb; and when warm weather came, the shoes settled down into soft dough.

Rubber was usually dissolved in turpentine, and turpentine is sticky. Perhaps the trouble was here,

he thought; and at length he succeeded in getting some rubber sap which had been kept liquid by alcohol. He was called away, and while he was gone his man Jerry had an idea. He plastered his overalls with the nice white liquid, and was soon wearing a fine pair of handsome white waterproof overalls. But alas, Jerry sat down too near the fire, and when the inventor returned his man had to be carefully cut out of his new garment. Evidently the stickiness was not in the turpentine, but in the rubber itself. Was there any way of getting rid of this one bad quality?

Goodyear had no thought of giving up. He tried mixing rubber with all sorts of substances, with magnesium, with quicklime and water, and with nitric acid. In trying to clean a piece of rubber cloth he had used nitric acid, and had found that the surface of the rubber lost all stickiness wherever the acid had touched it. He now made thin sheets of rubber and worked them into piano-covers, carriage-tops, even overshoes; and all these were far better than anything of the kind that had been made before. He sold licenses to use his process; he began to have a good income; and he brought his scattered family around him again.

A friend who had worked in one of the defunct rubber factories had tried combining sulphur with rubber and exposing this to sunshine. He told Goodyear of his experiments and showed him how this process took away the stickiness from the surface of the rubber. Goodyear had borrowed of

every friend who would lend to him, because he was firmly convinced that he would be able to pay his debts, but he never dreamed of making any unfair use of this confidence. "You must patent your process," he said, and this was done. Later, he bought the patent.

Success had come at last; that could not be doubted, for the Government had ordered one hundred and fifty mail-bags of him. Now people could see for themselves. He manufactured the bags and hung them where every one would have a view. This was in the early spring of 1838. He was away for a month, and when he returned there hung the handles of the bags, but the bags themselves were melting and dropping on the floor. Instead of a public success he had made a public failure. He could harden the surface of the rubber, but under this surface the gum was in warm weather as sticky as ever.

Rubber was certainly a most exasperating substance. To be able to cure the outside perfectly, but not to be able to affect it below the surface would have tried the patience of Job. It did try the patience of Mr. Goodyear, but he kept on. Sometimes he was cold, sometimes he was hungry. His friends, and at last even his wife, urged him to give up the quest. He loved his family and his friends, but he never ceased to believe that he must keep on, that he was the one man chosen to discover the secret that would benefit the whole world. When one process failed, he tried another, and he

was never sufficiently discouraged to think for a moment of giving up. He had always believed that some things cannot be found out by scientific research, but can be discovered by accident, and that the man who is most persevering will be the discoverer.

He was right in this case, for the discovery came when he was far from expecting it. He stood before a hot stove one day in 1839 with a piece of gum and sulphur in his hand, talking away on his usual subject. His audience, consisting of his brother and some friends, was bored, and more than half indignant with him for keeping on in this foolish chase. In one of his earnest gestures he touched the hot stove with the rubber. Instead of melting, it charred like leather, but around the charred portion there was a flexible border which was not charred, and was perfectly cured. Then how he did talk, and how out of patience his hearers became! They had seen things burned before, and there was generally a line about the edge of the burned part of anything that was not charred; charring had to stop somewhere. They did not see anything in this to make a man so excited; he must be half crazy. Perhaps he was, half crazy with joy. He nailed the rubber outside the door. It was a very cold night, but in the morning the ring about the charred spot was as flexible as before.

Now he experimented in good earnest. He found that this rim would neither soften with heat nor stiffen with cold. Rubber certainly was a myste-



Courtesy Goodyear Tire and Rubber Company

GOODYEAR'S DISCOVERY OF THE VULCANIZATION OF RUBBER

rious substance. When combined with sulphur, a little heat would melt it, and much would harden or "vulcanize" it. The great discovery had been made, but only a man who had been trying for

years to find it would have known that he had it at last.

Still, even this was only a beginning. He must find out just how much sulphur to use, what degree of heat was best, when and for how long the heat must be applied, and by what means. A process that failed one time in ten would be of no use commercially. He went at his experiments without a thought of anything else. He boiled the rubber and steamed it and roasted it. He baked it in heaps of sand in the fields, making his fires of sticks which he picked up. People were kind to him. The shops and factories allowed him to use their ovens after working hours, though his sticky mixtures were a great bother. The workmen grumbled and laughed at the messes, but they did not refuse what he wanted. His neighbors sent in food for the family and sometimes paid a bill or two for him. One man who was almost a stranger gave him money to continue his experiments; another sent him a barrel of flour. At one strenuous time he could find nothing in the house to pawn but his children's schoolbooks, and he pawned these. In the midst of his troubles he received a generous offer from a firm in Paris for the use of his nitric-acid process; but, starving as he was, he was too honest to accept it. The process is valuable, he replied, but it will soon be superseded by a new and better method.

So it was that the invention of vulcanized rubber came, like so many other inventions, from the anxious struggles and privations of the inventor and

his family. The result of Goodyear's efforts has been well summed up as follows:

"His process had more than the elasticity of India rubber, while it was divested of all those properties which had lessened its utility. It was still India rubber, but its surfaces would not adhere, nor would it harden at any degree of cold, nor soften at any degree of heat. It was a cloth impervious to water. It was paper that would not tear. It was parchment that would not crease. It was leather which neither rain nor sun would injure. It was ebony that could be run into a mould. It was ivory that could be worked like wax. It was wood that never cracked, shrunk, nor decayed. It was metal that could be wound round the finger or tied into a knot, and which preserved its elasticity almost like steel. Trifling variations in the ingredients, in the proportions, and in the heating, made it either as pliable as kid, tougher than ox-hide, as elastic as whalebone, or as rigid as flint."

For this invention Goodyear received little reward save the consciousness that the world would be better off because he had lived in it. Some of his later troubles were due to his neglecting to take out his patents promptly. Indeed, he delayed five years before taking out, in 1844, a patent for vulcanized rubber, and so left a loophole for the claims of other inventors. He once said that a patent amounts chiefly to a permission from the Government to fight one's own battles; and he had plenty of them to fight.

In 1852 came his great test case for infringement of his patent in the United States. Daniel Webster was his lawyer. It must have brought down the house when Webster pictured rubber as it was before Mr. Goodyear succeeded in vulcanizing it. "I had some experience in this matter myself," he said. "A friend in New York sent me a very fine cloak of India rubber, and a hat of the same material. I did not succeed very well with them. I took the cloak one day and set it out in the cold. It stood very well by itself. I surmounted it with the hat, and many persons passing by supposed they saw standing by the porch the Farmer of Marshfield."

Mr. Webster won the case for his client.

WILLIAM T. G. MORTON

MASTER OF PAIN

1819–1868

1846, ether first publicly used

In the Medical Library which stands in the Fenway, Boston, there is a famous painting. It represents a young man leaning back in an operating-chair and apparently unconscious. Beside him stands an older man who is evidently performing some operation on his jaw. Around these two are grouped a number of other men, watching intently, not the operator, but the face of the patient. A little to one side stands a man with features as clean-cut as those of a cameo. His hands are clasped on his breast as if he was under some severe mental strain. Back of this group and vanishing into the shadow are rising seats occupied by young men, some serious, some smiling a little mockingly, but all watching the face of the young man in the chair. This is the picture, and back of it is a story.

The man with his hands clasped on his breast is Dr. William T. G. Morton. He was born in the little hill town of Charlton, Massachusetts, and, so says the family tradition, he wanted to study medicine, but decided to become a dentist. Dentistry as a real profession was something new, and, in the country at any rate, it was hardly more of a science than shoveling snow. It consisted chiefly in ex-

tracting a tooth when its victim could not bear the pain of toothache any longer. And such extracting! Sometimes it was done by the family doctor, but it was perfectly lawful for the barber or the blacksmith or any wandering quack to pull a tooth and charge a fee for so doing. What their instruments were and their skill in using them may be imagined. In Baltimore the American Association of Dental Surgery provided for an eighteen-months course in real dental study, and thither Morton went. At the close of his course he opened an office in Boston, and was so successful that as early as 1844 his practice amounted to many thousands of dollars a year. But Morton was not the kind of man to be satisfied with what he had already learned. He must keep on learning, and, busy man as he was, he spent much time experimenting in a laboratory and then in studying in a medical school.

The most advanced dental work of the time was the making of artificial teeth; but the approved method would seem crude enough to-day. They were fastened with a soft solder to a gold plate. After a little the solder changed color, and around the top of every tooth a black line was formed. The use of artificial teeth always made a bad taste in the mouth, for the roots of the natural teeth were not extracted. Dr. Morton worked till he succeeded in making a hard solder, but it could not be used unless old roots were removed, a process to which people would not submit; and even when the dentist agreed to make no charge unless the work

was a success, they refused to undergo the pain. This can hardly be wondered at, for the use of ether was unknown.

The sufferings of people in those days of no anæsthetics were terrible. If the hip was out of joint, for instance, the muscles soon contracted, and to replace it one rope was fastened to the leg and another to the body of the sufferer. Each rope was drawn over a pulley, and then strong men pulled and pulled till the bone could be pushed back into its socket. The agonies of an operation with the knife can be imagined from the fact that men of muscle had to be at hand to hold the patient while it took place.

Dr. Morton's mind was on the problem of pain. In dental work brandy and opium and laudanum had been tried and had deadened suffering to some degree. Nitrous oxide, or "laughing gas," would sometimes serve, but its use was not fully understood, its effects were very short, and they were always doubtful, for sometimes it quieted the patient, and sometimes it excited him so that the work could not be done. In any case, they were not lasting enough for it to be of value in severe operations. Many a physician had pondered over this question of pain; and after experimenting had concluded that people might as well hope to fly as to escape suffering. Dr. Morton would not give up the quest. "I will yet banish pain," he declared. But how?

Of course in his dentistry he had tried everything

that seemed promising. In filling a sensitive tooth one day, he used ether, rubbing it on the outside of the jaw. It succeeded, and now he began to think about ether. This was not unknown by any means. Indeed, it was so well known that people sometimes breathed in a little to amuse themselves by experiencing the queer, half-conscious feeling that it caused. They were very careful, however, not to use too much, for there was a general belief that this would cause death. Ether mixed with air was sometimes given to children with whooping-cough to relieve the spasms. There might be hope in ether. Dr. Morton was aiming at saving the world from pain, and he forgot all about his own advantage. He put his business into the hands of an assistant, and set to work.

Now when people took ether for an amusement, they became sleepy and not fully conscious of what was going on. Would a larger dose make them unconscious? And would a still larger one result in death? It is no wonder that people did not come in crowds to Dr. Morton's office to try the experiment. He offered bribes, liberal sums of money, but no one cared to risk his life to carry out the whim of an experimenter. At length one of Dr. Morton's assistants agreed to try it. He became unconscious, then suddenly he was in a mad fury and ready to fight everybody around. It was found out afterwards that the ether was not pure; but there is no record that the assistant ever offered to try again.

There was only one person whom Dr. Morton could depend upon to become a possible victim, and that was himself. This was much more dangerous for him than for any one else, because there was a possibility of his taking too much and becoming so nearly unconscious as not to realize when the danger point was reached. It is no wonder that his wife objected; but he was determined to make the trial. He shut himself up in a room and began to inhale the ether. He felt numb; he could not manage his fingers; he pinched himself, but felt little pain; he tried to rise, but could not. Then he became unconscious, and so he remained for seven or eight minutes.

The experiment was a success. He had proved that a man could take ether enough to make him unconscious and not be harmed by it. But how would it be in severe pain? He soon found out. A man came to have a tooth extracted. Dr. Morton wet his handkerchief in ether and the man quietly breathed it in. A minute or two later Dr. Morton asked, "Are you ready?" "Yes, I am ready," the man replied. "Well, the tooth is out," said the Doctor; and it is no wonder that the man shouted, "Glory, hallelujah!" — for he had known nothing of the operation. The Doctor's patients began to be less fearful. One boy had so delightful a dream when under ether that he insisted upon having another tooth out on the spot.

Dr. Morton invited scientists to his office to see the effect of the anæsthetic. In 1846, he went to

Dr. Warren, senior surgeon of the Massachusetts General Hospital, and asked if he would give it a public trial. Dr. Warren promised that he would. A young man with a tumor on his jaw was to be given the ether and the tumor was to be removed. He had taken ether once before for some dental operation, and he had not the least nervousness. This could hardly be said of Dr. Morton. He knew that if there should be any fault in the apparatus for mixing air with the ether and carrying off the carbonic acid gas exhaled by the patient, he might be held responsible for a death. Mrs. Morton knew this, too, and begged him to give up the test. He would not yield, and they worked together on the apparatus through the night.

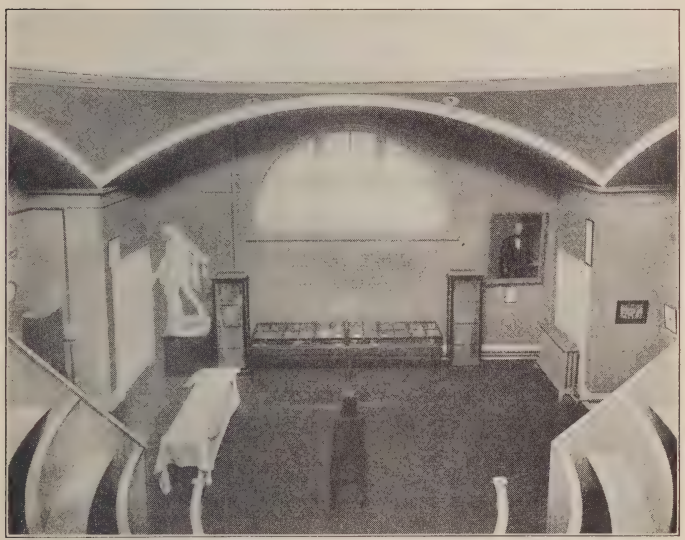
The operation was to take place at ten o'clock in the morning. Surgeons and medical students had assembled, but the Doctor did not appear. The students smiled scornfully and made idle jokes about the man with the ridiculous claim that an operation could be performed without any suffering. At a quarter-past ten, Dr. Warren rose. "As Dr. Morton has not arrived," he said, "I presume he is otherwise engaged." He was engaged — in waiting — for the instrument-maker had delayed him. Dr. Warren took up his knife; but the door opened, and the young dentist walked in. The ether was given and the operation was begun. This is the moment of the painting in the Boston Medical Library

A little later, the operation over, Dr. Warren

turned to the students and said, "Gentlemen, this is no humbug."

"How much pain did you feel?" the patient was asked, and he replied, "I felt none."

There was no lack now of appreciation of the discovery. One of the London papers described it,



THE ROOM WHERE THE FIRST PUBLIC TRIAL OF ETHER TOOK PLACE

This shows the present appearance of the room in the Massachusetts General Hospital where Dr. Warren performed the operation described on page 44. In the foreground are seen a part of the semicircular rising seats which were occupied by the students. The glass cases against the wall contain various surgical instruments, and at the ends two Egyptian mummies. The inscription below the window commemorates Dr Morton's discovery, and concludes with these words: "Knowledge of this discovery spread from this room throughout the civilized world, and a new era for surgery began."

under the heading, "Good news from America," as a gift "not for one nation, but for all nations, from generation to generation, as long as the world shall last."

Dr. Morton risked in his experiments his fortune, his liberty, and his life. He was the man who proved to the world that ether would produce unconsciousness to pain during operations. Whether he was the first and only discoverer of this fact is quite another question. In 1800, Sir Humphry Davy suggested the use of laughing gas as an anæsthetic, and it was so used by Dr. Horace Wells, of Connecticut, in the extraction of teeth. Dr. Charles T. Jackson, of Boston, with whom both Morton and Wells had studied, declared that the idea of using ether to prevent the realization of pain came from him. Dr. Crawford W. Long, in the little village of Jefferson, Georgia, had noticed that, when people were under the influence of ether, they felt no pain from falls and bruises, and early in 1842, four years before Dr. Morton's exhibition in the Massachusetts General Hospital, he employed the anæsthetic in operations. Although Dr. Long made no secret of his discovery, he delayed making formal claim to it, and with the caution of a scholar waited for opportunities to test its value in serious operations. These rarely fall into the hands of a village doctor, and he sent no account of his work to the medical journals until 1849.

So stands the story of the discovery of ether as an anæsthetic, a discovery in which there is glory enough for scores of scholars and investigators.

ELIAS HOWE

INVENTOR OF THE SEWING-MACHINE

1819–1867

1846, patented the first successful sewing-machine

In the good old New England fashion the whole Howe family worked. The father was farmer and miller, and the boys helped him. The mother and the girls kept the house. In country homes it was then the custom to help fill the family purse by doing various kinds of "sale work." The Howes and most of their neighbors spent their spare time sticking bits of wire into strips of leather, and so making the cards for carding cotton which not many years later a machine made so much faster.

At sixteen the boy Elias went out into the world to seek his fortune, quite in the fashion of the old fairy tales. He made his way into the enchanted castle, which was a great factory in Lowell, Massachusetts, where machines for spinning and weaving cotton were made. Two years later the bad fairy, in the shape of hard times, made her appearance, and closed every mill in the city.

But Boston is not far from Lowell, and there the young man went in search of a job. After a little he found it, on Cornhill, in the shop of a rather erratic genius named Ari Davis, who manufactured and repaired chronometers and surveyors' instruments. Now in the lives of all inventors something

always "happened one day" to set their minds to work. What "happened" to young Howe was the call of a man who was dreaming of inventing a knitting-machine. Maybe the shopkeeper was a little tired of his caller's talk. At any rate, he burst into it with —

"Why do you bother about a knitting-machine? Why don't you make a sewing-machine?"

"It can't be done," said the would-be inventor.

"Yes, it can," declared Davis. "I could do it myself."

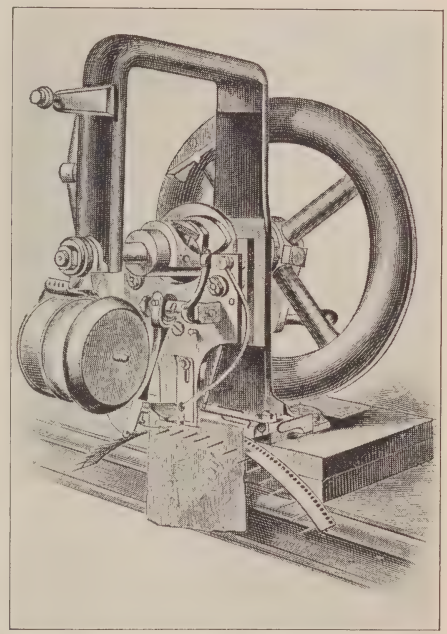
"Do it, then," retorted the caller, "and you will have an independent fortune."

Davis did not "do it," and no one paid any attention to the young fellow who was working quietly at his bench a few steps away and listening to every word. The idea of inventing was not new in the Howe family. One uncle had invented a spring bed. Another, seeking for glory rather than ease, had invented a valuable truss for roofs and bridges.

Of course the proper thing for a moneyless youth who had the bee of invention in his bonnet would have been to devote every minute and every penny to bringing it out. Instead of that, young Howe proceeded to get married, and when he was twenty-four he had a wife and children; and they were all trying to live on his wages of nine dollars a week.

When Howe came home after his day's work — and in those times a day's work lasted from sunrise to sunset — he always found his wife stitching,

stitching, trying to earn a little with her needle. It is no wonder that he thought of sewing-machines or that his first idea was to make one that would work with just the same motions as those taken by his wife's fingers, and would make a stitch just like hers. At length he began to wonder if some other kind of stitch would not be just as good; and now he was on the right track.



Courtesy Singer Manufacturing Company

THE FIRST SEWING-MACHINE MADE BY HOWE

He was not the first man who had tried to invent a sewing-machine, and some of them had met with a degree of success. Queerly enough, most of these people had aimed at making a machine that would embroider, and apparently had little thought of trying to make one that would sew up a seam. One used a needle with a hook like that of a crochet needle, and made a chain on one side of the cloth. Another used a common sewing-needle.

Pincers under the cloth pulled it down, and other pincers above the cloth pulled it up again. One had a horizontal needle which stood still while the cloth was pressed upon it. A very crude machine was made for sewing shoes. An awl made the hole in the leather; a spindle laid the thread over the hole; and a needle with no eye, but with a notch at the end, pushed it through. A loop was left underneath which was caught by a hook and held till a second stitch was made through it.

Howe had seen machines that would make a chain stitch; but this used up too much thread, left a ridge on one side of the cloth, and could be easily raveled. He had in mind some kind of stitch that would be firm and strong and would not leave a ridge. The idea of a needle with an eye near the point was not new, but the idea of using two threads, one passing through the needle's eye, and the other held in a shuttle underneath which should lock the stitch, was his own. He made a crude machine, and it sewed well enough to show that an excellent seam could be made if only the machine was perfect in all its parts. Models cost money; so does the support of a man and wife and their children; and there was no money. Mr. Howe's father had lost heavily by a fire and could give him no help. What could be done?

If Howe had not always been a kindly, good-natured person, it is hard to say what would have become of his invention; but he always won friends, and now an old schoolmate, one George Fisher,

came to the rescue. He agreed to give the Howes a home and provide five hundred dollars for buying tools and materials. If the machine succeeded, he was to have half the profits.

All that winter of 1844–45 Howe worked on his model, while the neighbors gossiped over the folly of George Fisher in throwing away on such a wild-goose chase the money which he had just inherited; but when July came he appeared among them, wearing a suit of clothes sewed on the new machine.

One would suppose that all the tailors in the land would have been eager for a machine, but they would not even try it. They declared that its seams could not possibly be as even and strong as those made by hand. "I will show what it can do," said Howe; and he carried the machine to a clothing factory. "Give me ten seams of five yards each," he said, "and I will sew them before five of your swiftest seamstresses can do the same amount." He did it, and all had to admit that his seams were much better than theirs.

Still no one would buy the machines. They were expensive, to be sure, costing three hundred dollars each, but a stronger reason was the fear that they would throw men out of employment. The inventor did not lose courage. He worked for three months on a second model of his machine, for he could not patent it without having one to deposit at the Patent Office. Then he and Fisher went to Washington and secured a patent; but still no one ordered a machine.

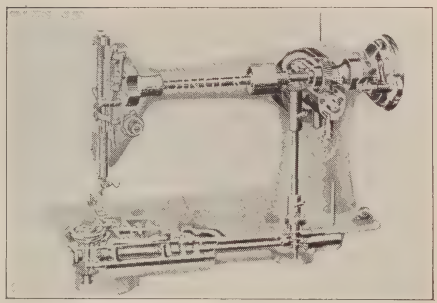
Fisher had now put two thousand dollars into the invention, and he could do no more. Perhaps there would be a chance in the great factories of England, and Howe's brother Amasa took the precious little box containing the model and went by steerage to England. A manufacturer bought the machine, paid for it, and secured from Amasa Howe the right to patent it in England. He agreed to pay the inventor £3 for every machine sold in that country; and he contrived so to impress Amasa with his honesty and trustworthiness that the inexperienced American did not even have the agreement put in writing.

The manufacturer sent for the inventor and his family to come to London to adapt one of the machines to the making of corsets. Howe went gladly and was successful; but just as soon as the machine was done the manufacturer had no further use for him; and although he himself became a millionaire from the patent, Howe never received a shilling of the royalty that had been promised.

Troubles were heaped upon him. His wife had to return to America or starve; and soon he himself followed her, paying his passage by cooking for the emigrants on the boat. He reached New York with only sixty cents in his pocket, and he had hardly secured work before he heard that his wife was dying. Then came news that his model had been lost in a shipwreck. Again friends came to his rescue. They offered to care for his children, and he went to work as a machinist. It was not long

before he discovered that his machine had come into use, but not under his name. It had been altered so that no one but the inventor would have easily recognized it. Then Howe was aroused. Again a friend lent him money, and he fought for his rights in court after court, winning every suit.

After all his struggles he became in a day a rich man. He enjoyed his money and was ready to admit the fact; but he enjoyed it more for what it would buy for others than for the luxuries that it would provide for himself. When the Civil War broke out he organized a regiment and presented each man with a horse. He was elected colonel of the regiment, but he declined and enlisted as a private, and served in the ranks until his health gave out. Then he became regimental postmaster, determined to help in one way if not in another. Perhaps he never realized fully how much he did help, for it is hard to see how the uniforms and tents and sails and shoes for the soldiers and sailors could possibly have been made without the machine that he had invented.



Courtesy Singer Manufacturing Company

THE SEWING-MACHINE OF 1921

The latest model of this sewing-machine can be run by an electric motor. Compare this highly perfected piece of mechanism with the crude device invented by Howe.

MARIA MITCHELL

ASTRONOMER AND TEACHER

1818–1889

1848, elected to the American Academy of Arts and Sciences; the first woman on its roll

A MAN on the roof of a house, peering through a telescope, and his little daughter beside him, "counting seconds" by a chronometer — this is our first view of Maria Mitchell and her father.

The home of the Mitchells was on the windy island of Nantucket. They were Quakers and lived in Quaker simplicity; but Nantucket had a good library, and the Mitchell home was always well supplied with books. The father taught the grammar school, then became cashier of the island bank. He held several public positions of honor; he was a State Senator and for many years one of the overseers of Harvard College. He was quite as well known, however, by his articles in scientific magazines. He loved astronomy, and he owned a little observatory, which enabled him to add to his income by doing astronomical work for the United States Coast Survey, and also brought to his home some of the best-known scientific men of the day.

Before long his daughter Maria became known as a skillful astronomer. One night in 1847, when she had, as usual on clear evenings, taken her lantern and gone to the roof to "sweep the heavens," she

called her father and told him she believed she had seen a comet. The father eagerly wrote to the Cambridge Observatory of the discovery, stating the position of the comet and when it had appeared.

Now it chanced that Edward Everett, who was then President of Harvard, had learned that about the time when the little girl of twelve was counting seconds for her father, the King of Denmark had offered a gold medal to the first discoverer of a telescopic comet. The king was dead, his son cared little for astronomy. Moreover, the announcement of the discovery had been delayed two days by the lack of mails from the island, and had not been reported to the proper authorities. "Miss Mitchell's comet" became the subject of considerable correspondence between Cambridge and Copenhagen; but at length the gold medal appeared, and the happy young astronomer was straightway made a member of the American Academy of Arts and Sciences, the only woman ever admitted to membership. She was a little amused at the amount of lionizing that she received. "It is only a sort of theatrical performance," she said; and she returned quietly to her island. She worked on the *Nautical Almanac*, she "swept" — both the skies and the floors; she sewed, she cared for her mother, she knit long stockings for her father, she made tatting between times, she took a lesson or two in whist and learned — so she said — to understand what her partner meant when she winked at her. In short, she did not behave at all as some folk might have ex-

pected of a young woman who had suddenly become famous.

For a number of years she had been librarian of the Nantucket Library, and out of her small salary she had each year saved a part for a trip to Europe. Now it was made. She saw the things she most wanted to see — observatories, of course — and she met the people she most wanted to meet — astronomers, of course — Humboldt, Mrs. Somerville, Leverrier, Sir George Airy, and the Herschels — and she came back to Nantucket rested and happy.

Soon after she returned from Europe a great pleasure came to her, the gift of a fine equatorial telescope from a number of American women. Another gift which found her about the same time, and which she valued very highly, was a medal from the tiny Republic of San Marino, perched far up on the Apennines and "entirely surrounded by Italy."

On a second trip to Europe she paid a visit to the observatory at Pulkova, near St. Petersburg [Petrograd], Russia, over which the eminent astronomer Struve presided.

In 1860 Mrs. Mitchell died. It was desirable for the daughter to be nearer Boston, and the father was attracted to Lynn because of the number of Quakers who lived there. The Mitchells left the island and for five years they made their home in Lynn. Then came a great change. Vassar College was about to be opened, and Miss Mitchell was appointed Professor of Astronomy and Director of the

Observatory. Should she accept the appointment? Her father said yes, and in 1865 father and daughter took possession of the Vassar Observatory.

Mr. Mitchell had snow-white hair, a kindly,



AN OLD VIEW OF VASSAR COLLEGE

This shows the main building; also at the left the Observatory in which Miss Mitchell did her work, and at the right the Museum building. The view is taken from a print in an early catalogue of the college.

courteous manner, and a delightful fashion of talking a little with any students whom he met as he walked about the college grounds. Everything was so new and experimental that the presence of this serene, benignant, old-school gentleman during the four years that he lived after coming to Vassar was like the quiet after a storm.

Miss Mitchell had a strong, handsome face, framed by short iron-gray curls. Her eyes were dark and piercing, but with an expression of friendliness that won the confidence of every one who met her. Whether she praised or blamed, she was

equally frank. To a class-day speaker she said, "I came out as soon as you were through, for I knew that I had heard the *crême de la crême* of the occasion." A man of wide reputation once insisted upon imposing his somewhat condescending criticisms upon her, and ended by telling her that she was wasting her time in going over to the college dining-hall for her meals. "You could easily make yourself a cup of coffee and boil an egg in the morning," he declared. She demanded with an air that must have made him feel like an impertinent small boy, "And is my time worth no more than to boil eggs?"

In her classes Professor Mitchell was an inspiration, and the students responded to her appeal. "I think the Vassar girls, in the main, are magnificent, they are so all-alive," she wrote in her journal, never seeming to suspect that no one could be dull and stupid under her influence, "the bright, unwavering star," as the president of the college called her. In her famous "dome parties," given each year to the students in her classes, the girls sang to the tune of "John Brown":

"We're singing for the glory of Maria Mitchell's name,
She lives at Vassar College, and you all do know the same.
She once did spy a comet, and she thus was known to fame,
Good woman that she was.

.

"Though as strong as Rocky Mountains, she is gentle as a lamb,
And in her way and manners she is peaceable and calm,
And our mental perturbations she sootheth like a balm,
Good woman that she am."

At the first singing of this she replied, "I'm not a wise woman, but I am glad you think I am a good woman."

Many a college textbook is scribbled over with her choice words of wit and wisdom, such as these:

"Every formula which expresses a law of nature is a hymn of praise to God." "I do think, as a general rule, that teachers talk too much. A book is a very good institution."

"We wait and ask for precedent. If the earth had waited for a precedent, it never would have turned on its axis."



Courtesy Vassar College

MARIA MITCHELL AND HER ASSOCIATE

This picture shows the interior of the dome of the observatory at Vassar College. Miss Mitchell is seated beside the twelve-inch equatorial telescope which she used in her work.

"Mingle the starlight with your lives, and you won't be fretted by trifles."

"Medals are small things in the light of the stars. There's only one thing in the world of any real importance, and that is goodness."

"Be content to get on slowly if you only get on thoroughly."

Professor Mitchell received honorary degrees from Dartmouth and from Columbia; she was made a member of numerous scientific societies; she was president of the American Association for the Advancement of Women: her scientific papers were regarded as of great value and highly praised; but she never developed any more self-consciousness than when she was a little girl on Nantucket.

In 1888 she resigned her position. The trustees made her Professor Emeritus and offered her a home at the observatory, but she preferred to spend her last years with her family in Lynn.

HENRY OSCAR HOUGHTON

PRINTER AND PUBLISHER

1823–1895

1852, founded The Riverside Press

It is a good thing to be born, as Henry Oscar Houghton was, into a family of ten children of all ages from twenty-one years down. By and by a little sister arrived, and then the round dozen was complete. Their home was in the little "maple-sugar town" of Sutton, in the northeast corner of Vermont. Sutton was a pleasant place to live in, with its woods and fields and pastures and hills and yet more hills, with a mountain or two on one side and Willoughby Gap on the other; but in 1833 the family left it and moved to Bradford.

As the wagon of household goods creaked along the family cows followed it in sedate procession. By this time the older children had scattered. A boy of ten years, however, could be quite a helpful person, and the little Oscar, as he was called in the old New England fashion of making a middle name do its fair share of the work, saw to it that the humble followers did not turn aside from the way in which they should walk. When he was tired he mounted the load of goods and rode in lofty state. The family spent the night at a tavern, a new experience for the little country boy. He was a bit shy, and all his life he remembered appreciatively

the kindly touch of the hand of the landlady's daughter on his head as she gave him his bedroom candle and said a friendly good-night.

In Bradford there was an academy, and he went to school for three years. He was a man then, he thought, quite grown up, thirteen years old, and he began to consider what he should do to support himself. The result of his meditations was that one dark morning late in the autumn he climbed into the big lumbering mail-coach and in a heavy snowstorm made his first little journey out into the world. He did not regard it as a "little" journey, however, but as an event of vast moment; for he had the honor of eating dinner in the capital of the State just as if he was one of those awe-inspiring men who had laid aside their farmers' frocks, and in blue coats and brass buttons had become members of the legislature and lawmakers for the whole State.

In the middle of the night he reached Burlington, his journey's end, for here he was to spend the next six years as apprentice in a printing office, learning the mysteries of typesetting. All sorts of people come into a printing-office, and one day a tall, slender man came to the case where the boy was at work and said, "My lad, when you use these words, will you please spell them according to this list?" and he gave him a list of such words as *theater*, *center*, and the like. This was one of the great men of the day, Noah Webster. He had already published his dictionary, but he realized that

people in general would spell not according to some scholarly theory, but according to forms that they saw every day in print, and he was very wisely beginning his work at the printing-offices.

The boy was on his way to college. He had saved up eighty dollars from his earnings, and felt



A Few of the Printing Presses at The Riverside Press

This room has a saw-tooth roof and large windows so that it receives the maximum of daylight. Great printing establishments are equipped with several rooms of this sort.

quite a man of wealth; but at the last moment his employer failed, and at the age of nineteen he opened the college doors with just three York shillings in his pocket. It took two of these to settle him in his room, and there remained twelve and one-half cents to pay his expenses for four years.

He was hardly better fitted intellectually than

financially, for most of his studying had been done without much guidance and after a long day's work at the composing-case. "But I'm going to try it," he said pluckily to a friend, "and see if I can't catch up and keep up and make my living too."

He had some help from his family in making his living, but the catching up and keeping up depended upon his own grit, and that never failed. One of the hardest things for him to do was to speak in the debating society, but he was determined not to give in. He tried his very best to speak. He always had some real thought to bring forward, but he never could bring it. He stammered and hesitated, then sat down. The boys laughed, and he laughed too — and the next meeting he tried again. This was in the freshman year — and at the sophomore exhibition, the boy who had been so awkward and stumbling was the one chosen for the place of honor, to make the closing speech of the afternoon.

In the eighteen-forties it was expected that a boy who went through college was aiming at being a doctor, lawyer, or minister. It was quite proper for him to begin work in any one of these lines by teaching, and this young graduate went to Worcester, Massachusetts, expecting to find a position to teach near that city. But the mails had been delayed, and the position was filled. Not at all discouraged, he went straight to Boston, and there he became a reporter and proof-reader on the *Daily Traveler*. He found friends, he climbed Bunker Hill Monument, he visited the library of Harvard

University, and was not at all sorry that he had come.

It must have been apparent that he could do something more than set type, for before long he had an opportunity to go into partnership with a well-established firm of printers. They were willing to put their twenty years' experience on a par with young Houghton's college education, and now the only thing lacking was the money.

The day came when he must give his answer, and his pocket was empty as ever. But quite in the story-book fashion there was a knock at the door. "Is this Oscar Houghton?" asked the friendly voice of a well-to-do New England farmer. He proved to be the husband of a relative, who had told him to be sure to call on "Cousin Oscar.' This visitor became interested in a talk about the business, and at length offered to lend the necessary money to enter the new partnership. This was the beginning of The Riverside Press. The business soon fell entirely into the hands of Mr. Houghton.

Strictly speaking, the business of a printing-house is to print according to the wishes of the publishers who employ it; but to make a man a publisher does not necessarily make him a man of good taste; and many books of the earlier and middle part of the nineteenth century were volumes of irregular size and shape, with pages too long or too short, with poorly proportioned margins, and with foolish little scrolls and ornaments. The paper was generally poor, and the ink was often darker on

one page than another. Spaces between the words were irregular; spaces between the lines were often too narrow for easy reading; and the books were frequently so poorly bound that even with the utmost care they would not open without cracking.

Mr. Houghton had an instinctive good taste which led him to make pages of the proper proportions, to omit the silly little scrolls, and to use clear, dignified type that would not call the reader's attention to the letters, but would leave his mind free for the thought. He spread the ink and arranged the spacing properly, and he bound the volumes so that they would bear long use. Even the people who did not know how to plan books could not help realizing that these Houghton volumes were of unusually good appearance, and they did not often need much urging to allow Mr. Houghton to carry out his own ideas. Other printers began to follow his example, and the printing of to-day owes much of its general excellence to the reforms of the printer of Riverside.

The books printed at Riverside were almost always books of permanent value. When Noah Webster asked the young typesetter to use his spelling, he never guessed that the young man at the case would become the printer of his dictionary; but this came to pass, for Mr. Houghton now made an engagement with the publishers of *Webster's Unabridged* to print the dictionary, tons and tons of it, every year.

But the thoughts of this printer were gradually

turning toward publishing, and soon a new firm, Hurd & Houghton, was formed. The printing-house was not neglected by any means, but received



A Gathering Machine

Printed sheets folded into 16-page sections are brought to the gathering machine and placed in compartments. The machine then automatically assembles and staples complete books, which are examined at the far end of the machine, and piled on rolling tables for expeditious delivery to the next machine in the process of binding.

even more care and attention. Better work was then done in Europe than in America, and Mr. Houghton went to England to secure the best workmen and the best type and binding that could be found. "Tout bien ou rien," *Everything well or nothing*, did not appear on the title-page of his books until later, but it was his motto from the first.

The new firm began with standard literature for adults; but the children were not forgotten. Children's books and magazines came chiefly from

England. Their ideas and teachings were English. People did not talk about "Americanization" in those days, more's the pity, but Mr. Houghton believed that American children should have American teachings, and he decided not only to bring out books for children, but also to publish a magazine for them. This was the origin of the *Riverside Magazine*. For many years the *Atlantic Monthly* was printed at The Riverside Press.

The firm name was changed from Hurd & Houghton to Houghton, Osgood & Company; afterward to Houghton Mifflin Company. The offices are now in New York, Chicago, Dallas, Atlanta, and San Francisco as well as in Boston. The Boston office is in one of the old mansions, and the homelike rooms give a hint of the friendly relations existing between the publishers and the authors on their lists.

How did it come about that the great publishing house with which authors are proud to be connected was brought into existence by the boy who entered college on a capital of three shillings? In the first place, Mr. Houghton did not leave anything to be managed at haphazard; he had certain definite principles of business. He said, "I put all my eggs into one basket, and then I carry the basket." He "carried the basket" by paying close attention to little things as well as big ones. When he gave an order, he saw to it that the order was obeyed. "If I tell a boy to hang up my overcoat," he said, "I expect him to come back and tell me he has done it." For many years not one letter or one bill was sent

away which he had not read; and when the business became too large for this, little yellow paper memoranda were always brought him of each day's correspondence. He looked upon his business not only as a business, but as a charge entrusted to him for which he was in duty bound to do his best; and it was his great pride to make sure that the name "Riverside" should be a mark of quality. As one of his friends said, "He thought of it [his business] as an artist thinks of the picture he paints."

He came before working hours, and he often paid the office a call late in the evening. He required accurate, thorough work: but there was little to complain of when he demanded more of himself than of his men. In a time of panic he was advised to discharge some of his workmen; but he had never forgotten what it meant to need work, and he replied emphatically, "Shorten my pay-roll? Turn people out of work? *Never!*" In any disagreement he could always see the other side. "I try to think how I should feel if I were in ——'s place," he once said.

This same consideration was carried into his relations with the authors whose names were on his list. In the most carefully made agreements there will sometimes be a loophole for misunderstanding; and this man, who could not be *forced* to yield a penny to any one, said, "If there is ever any question in regard to what is due to an author, always give the author the benefit of the doubt." In one instance in which the arrangement was that the

author should pay the cost of publication, the book failed to sell, and although Mr. Houghton had advised against publishing it, he assumed the expense. "We are better able to afford the loss than the writer is," he declared. It is no wonder that one of "his" authors said, "If I were in any trouble, I should want to go and tell Mr. Houghton."

Such was the man who succeeded, the man who deserved to succeed.







On this page are printed three "colophons" used at various times by Houghton Mifflin Company. Emblematic devices of this sort have been used by printers in all ages since the invention of their art; at first, on the last page of their books, but in recent times on the title-pages. The motto, "Tout bien ou rien," means "Do it well or not at all," and had long been followed by Mr. Houghton in his work before it was used in the colophon. The first design was made by Elihu Vedder, the artist who illustrated *The Rubáiyát of Omar Khayyám.* The other two designs are adapted from Mr. Vedder's suggestion by other artists, and it is interesting to see how the same general theme has been kept. Another form of colophon is shown on the title-page of this book.

CYRUS W. FIELD

THE MAN WHO LAID THE ATLANTIC CABLE

1819–1892

1858, the Atlantic Cable successfully laid

THE Field boys were sons of a dignified minister of the old school, but at their early homes in Haddam, Connecticut, and Stockbridge, Massachusetts, stories of their pranks are still told. One boy, in the midst of his father's sermon, walked gravely up the aisle of the church with a rat-trap in his hand and a look of innocence on his face. The trap had been mislaid, and his father had said, "Whenever you find that trap, bring it to me at once." The boy had obeyed.

Cyrus was the sixth of the seven boys. At fifteen he was in New York, in the famous old store of A. T. Stewart, and before he was twenty-one he was a partner in another New York firm. The firm failed, and the junior partner took upon himself the burden of debt. He gave up to the creditors every dollar that he had, and was released from all claims. Then he went into business for himself.

He was so successful that in 1853, before he was thirty-four years of age, he retired with a fortune of $250,000, equal to fully $1,000,000 to-day. Then he turned back to his old account-books, opened his check-book, and sent to every one of the debtors of ten years before a check for the difference between what had been paid him and his full claim, including

also seven per cent interest for the ten years. He did even more than this, for he forgave the debts of several men who owed him money. Then he retired from business and made ready to travel, rest, and enjoy a quiet, happy home life.

One of Cyrus Field's brothers said of him, "I never saw Cyrus so uneasy as when he was trying to keep still." Certainly, in this case, "Cyrus" had hardly given up work before he began to be more active than ever before — which is saying a good deal. Possibly it was this same brother who set him to work by introducing an electrical engineer named Gisborne. Mr. Gisborne had formed a company to connect St. John's with New Brunswick and the United States partly by land telegraph and partly by submarine cable. A short cable had already been laid between Prince Edward Island and New Brunswick, and thirty or forty miles of telegraph erected when the money gave out. He had now come to New York to try to interest capitalists in the undertaking.

Mr. Field soon became convinced that the scheme was practicable, and one night, after Mr. Gisborne had returned to his hotel, he stood in his library thinking and studying the large globe that stood there. He was looking at the eastern coast of the United States, at Newfoundland, and at Ireland. Distances seemed short on the globe, and he began to wonder why, if it was possible to connect Newfoundland and the United States, it was not possible to connect Newfoundland and Ireland.

Mr. Field did not jump at conclusions, but he did his thinking rapidly. The result of his thinking that evening was that in the morning's mail he sent one letter to Professor Maury, the geographer, and another to Professor Morse, inventor of the telegraph. He also talked with his lawyer brother and with Mr. Peter Cooper. A small but wealthy company was formed; but people in general had little confidence in the scheme. "If you lose your cable, and it goes to the bottom, what shall you do?" some one asked Mr. Field "Charge it to profit and loss and lay another," he answered cheerfully.

The cable was made in England. It consisted of seven copper wires covered with gutta-percha and wound with tarred hemp. The plan was for an American vessel, the *Niagara*, to start from Valentia, Ireland, and lay the cable halfway to Newfoundland. There she was to meet an English vessel, the *Agamemnon*. The cable was to be spliced in mid-ocean and laid by the *Agamemnon* to Trinity Bay in Newfoundland.

The ship came to anchor off Valentia Bay. Crowds had waited all day long for the sight. "It 's the cable that will be bringing us nearer to the country that sent us food in the famine, bless her!" one man cried; and when the end of the cable was brought to land, the crowd swarmed about it to help pull, and the man who could show a tarry hand was a hero to all his neighbors.

The cable was fastened firmly to the shore. The rector of the parish made a prayer, the people

cheered for the United States, for "Yankee Doodle," for the Queen, and the President, and the American Navy, and the officers and men who were to lay the cable, and for Cyrus Field. He replied, "If ever on the other side of the water, one of you present yourself at my door and say you had a hand in this, I promise you an American welcome."

The ship sailed, and for four days all went well; then the cable broke. This meant a loss of $500,000 and a year's time. New capital was raised, and the following year (1858) the same two vessels started in mid-ocean, one toward Ireland and the other toward America, laying the cable as they sailed. Again it broke, but the third attempt succeeded.

The whole United States celebrated. Even in little Stockbridge "Bells were rung, guns fired; and the children, let out of school, shouted, 'The cable is laid! The cable is laid!'" Queen Victoria cabled a message to President Buchanan, and President Buchanan cabled a reply to Queen Victoria. New York was wild with delight. There were illuminations and processions and dinners. There were receptions and fireworks and torchlight parades. One of the transparencies carried among many others in the torchlight parades is shown on page 75.

John G. Saxe wrote his poem, *How Cyrus Laid the Cable*. Telegrams of congratulation came to Mr. Field by the hundred — and then the cable stopped working.

Lightning
caught and tamed by
FRANKLIN,
taught to read and write and go on errands by
MORSE,
started in foreign trade by
FIELD, COOPER & CO.,
with
JOHNNY BULL
and
BROTHER JONATHAN
as
special partners

Mr. Field's wonderful perseverance and his sense of honor were equally strong. When he retired from business he had agreed at the request of his partner to leave nearly half his money in the firm. On returning from England after the loss of the first cable, the first news to meet him was that in the panic of 1857 his firm had suspended. As before, he took the debts upon himself, and two years later he paid every penny. In 1860, just before the breaking-out of the Civil War, he was again obliged to suspend. He gave up everything that belonged to him, even the pew which he owned in church and the portraits of his father and mother, and went to work bravely to pay the full amount. As to the cable, he was as courageous as ever. He wrote, "I never had more confidence in the ultimate success of

the Atlantic Telegraph Company than I have today."

Even if he did have confidence, others did not, and raising money for a new cable was no easy matter. On the other hand, there was a better chance of success than ever before. Much had been learned about under-water telegraphing; better steel wire was made; and the *Great Eastern*, the largest steamer that had ever sailed, was ready to become the cable ship. The trial was made, but this time some of the ship's machinery broke down. This was the fourth failure.

The stockholders met, and they decided to send out another cable the following summer, 1866, and also to try to pick up the lost cable. Mr. Field returned from England. When the passengers on the steamer heard that he was on board, they made ready to sympathize with him in his disappointments; but they had no chance, for he was "the most cheerful one on board." They tried to condole, but he replied serenely, "We have learned a great deal, and next summer we shall lay the cable without doubt."

They did. In five months after the new company was formed, the cable had been laid by the *Great Eastern* and was carrying messages across the ocean. The cable lost in 1865 had also been recovered. "Both O.K.," the operator telegraphed. Of that moment Mr. Field says, "I went to my cabin, I locked the door; I could no longer restrain my tears — crying like a child, and full of gratitude to God."



LANDING THE ATLANTIC CABLE ON NEWFOUNDLAND

The steamship is the *Great Eastern*. This ship, launched in 1858, was the largest of her time, displacing 32,000 tons. Her best record across the Atlantic was eleven days. The largest ships of the present time (55,000 tons) make the passage in about five days.

On both sides of the ocean were ardent hopes that the Atlantic cable would bring the world together and prevent all future wars. Whittier wrote in his *Cable Hymn:*

"And one in heart, as one in blood,
Shall all her peoples be;
The hands of human brotherhood
Are clasped beneath the sea."

Congress presented Mr. Field with a gold medal and the thanks of the nation. John Bright, the English statesman, declared that he had "moored the New

World alongside of the Old," which some disrespectful American translated, "He has hitched the British Isles to America."

And what did Mr. Field himself do while all the world was rejoicing and singing his praises? He went back to America and paid, with seven per cent interest, every dollar due to his creditors of 1860.

JEAN LOUIS RODOLPHE AGASSIZ

BELOVED TEACHER OF SCIENCE

1807–1873

1860, Agassiz Museum at Harvard dedicated

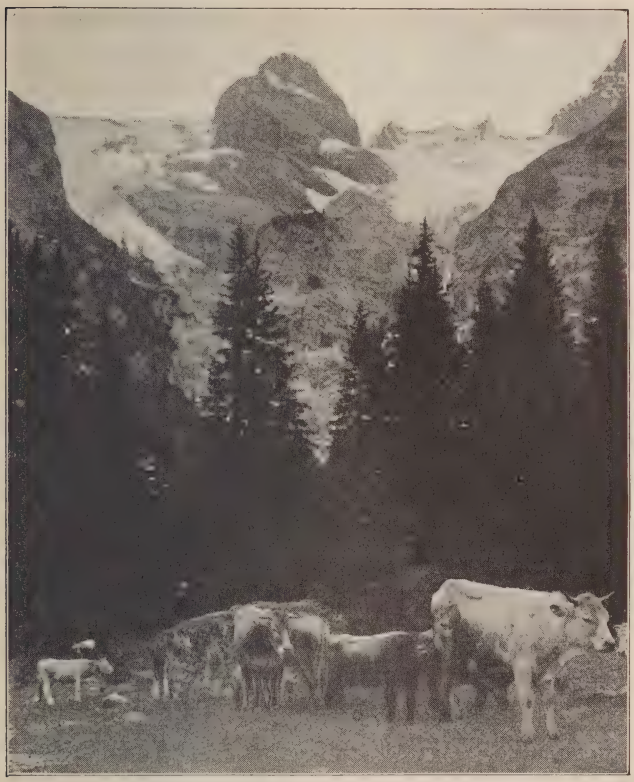
THE King of Bavaria once sent some scientists to Brazil to collect specimens of plants, shells, insects, and fishes. Before the books describing these could be prepared, the naturalist died who was to have prepared the volume on fishes, and of all the learned men in the land the one who was asked to write the Latin descriptions of the fishes and edit the volume was a young student of twenty-one years who was working for his degree as doctor of medicine. It is no wonder that he was radiantly happy, especially as he knew that he could do the work well.

This young man was Louis Agassiz, and he was the son of the pastor of a village church in Switzerland. His parents had insisted that he should take a medical degree, so that he could be sure of a living; but his heart was in natural history. Before he was seventeen he knew every beast, bird, and fish in the vicinity. He had not been able to buy many books, and so he had done the wisest thing in the world, namely, he had spent his time studying the animals themselves; and he knew them, especially the fishes, so thoroughly that when at last he had free access to books, he was surprised to find so little that was new to him.

A strenuous time the next two years must have

been. The young student prepared the *Brazilian Fishes*, and joyfully sent a copy to the little Swiss village. "Will it not seem strange," he wrote home, "when the largest and finest book in papa's library is one written by his Louis? Will it not be as good as to see his prescription at the apothecary's?" Nevertheless he took his doctor's degree, and with high honors. He also took the degree of doctor of philosophy. Two years later he became a Professor of Natural History at Neuchâtel. It was while he was at Neuchâtel that his great work on fossil fishes came out. This was in five large volumes with a big atlas of four hundred plates.

Agassiz was interested in everything in nature, and he was quite capable of leaving a chapter on fishes for a while to study the structure of a mountain or the work of a glacier. He had a friend, who was also a naturalist, Jean de Charpentier, and this friend had a theory. Scattered over Switzerland are great boulders, and Charpentier believed they had been carried on glaciers and left in their present places when the ice melted. Agassiz said no, and went to visit his friend to prove that this was a mistake. On the contrary, he himself became convinced that Charpentier was right, and that in some remote age ice had swept over a large part of the surface of the earth, even over regions that have now a warm climate. Most scientists laughed at this theory. One declared that the glacial scratches on the rocks about Neuchâtel had been made by boys sliding downhill!



A Mountain Pasture in Switzerland

Glaciers are shown among the mountain tops in the foreground. This picture gives a clue to the character of the country in which Agassiz did his early work.

Agassiz did not give up the theory, but studied more and more the work of ice. In 1840 he built a little cabin on the glacier of the Aar, and here he and other students spent six summers. The snow and rain came into the hut; once it blew over. They were cold and uncomfortable, but blissful. They

climbed the Jungfrau and stood one by one on its two-foot summit. They studied glaciers to their hearts' content, and Agassiz had himself let down by ropes into the very heart of the Aar glacier; and also into a well of ice water, for he had been so absorbed in studying the ice that he had forgotten all about the water below it. After this careful study of glaciers no scientist could doubt his theory of the "ice age." What caused it is another matter; and that question has not yet been answered.

But even a hut on a glacier costs something. To pay artists to sketch his fossil fishes — one of these artists, on a regular salary, spent seven years in England sketching from the collections of fossil fishes in that country; to bring out illustrated books, and present them to every student who needed them, but could not afford to buy them; to pay or even to board his assistants and to care for his wife and children, was expensive. His friends helped, and sometimes a scientific society or a science-loving sovereign helped; but Agassiz was always in need of money, and he was always in debt. To pay these debts, "serve science, and at the same time live in the world," as he put it, he must earn more money. Would it be possible to do this in America?

Agassiz had been considering this question, and so had his friend Humboldt. The older scientist did not perhaps realize Agassiz's ability to carry on interest in several lines at the same time. He was afraid that this study of glaciers was taking his attention away from the study of animals, where his

work was so especially valuable, and he induced the King of Prussia to offer Agassiz an appointment to go to America to compare the animal life of the temperate zones of that country and Europe. His salary as professor was to be continued and a generous sum was added to it for his mission. In 1846 he set sail for Boston.

His name was well known on this side of the ocean, and even before sailing he was engaged to give a course of lectures at the Lowell Institute, in Boston. These lectures and those that followed, in city after city, were a delight to his audiences. Agassiz did not speak English very well, but he was so interested in his subject that when he could not think of a word, he was not embarrassed, but waited till it came, so happy in finding it that his hearers were happy with him and never out of patience. If the word positively refused to come, he could express his ideas with a bit of chalk and a blackboard.

In 1848 an invitation came to Agassiz from Harvard University to become Professor of Zoölogy and Geology in its new scientific school. There was as yet no museum, and he set to work to make one. He wanted something quite different from a mere collection, no matter how full; he wanted a museum of comparative zoölogy, a collection that would show the relations of the animals to one another and of those now living to those of past ages. Everybody wanted to help. The fishermen delighted in bringing him everything at all unusual that came to their nets. Captains of whalers and coasting ves-

sels carried cans of alcohol to preserve specimens for him. Every one was glad to do him a favor, for every one loved him. Lowell wrote,

"Where'er
He met a stranger, there he left a friend."

Learned men did not send him their "respects" or their "best regards"; they sent their "love." He was always in high spirits, always charming, ready to talk with scholarly scientists about geological theories, or to play games with little children. Those were wonderful days in Cambridge. Think of the famous Saturday Club, at whose dinners sat Longfellow, Holmes, Lowell, Hawthorne, Emerson, Felton, Whittier, Agassiz! Every one knows the charming poem which Longfellow read on Agassiz's fiftieth birthday, beginning,

"It was fifty years ago,
In the pleasant month of May,
In the beautiful Pays de Vaud
A child in its cradle lay.

"And Nature, the old nurse, took
The child upon her knee,
Saying, 'Here is a story-book
Thy Father has written for thee.'"

When Longfellow came to the last verse,

"And the mother at home says, 'Hark!
For his voice I listen and yearn;
It is growing cold and dark,
And my boy does not return!'" —

Agassiz broke down completely. Two years later he

spent the summer in Europe, nearly all of it with his mother.

Honors came to him thick and fast, the noblest being an invitation from the French Government to take the highest scientific position in the land; but Agassiz loved the United States and his work on this side of the ocean, and he declined.

The United States appreciated him. Wealthy men arranged scientific trips for him to different parts of America, to Lake Superior, Florida, Brazil, the Rocky Mountains, the Straits of Magellan; and everywhere he found new treasures and new delights. When he started for Brazil, Holmes wrote,

> "It thrills the spinal column
> Of fossil fishes solemn,
> And glaciers crawl the faster
> To the feet of their old master!"

and ended,

> "God bless the great professor,
> And the land his proud possessor."

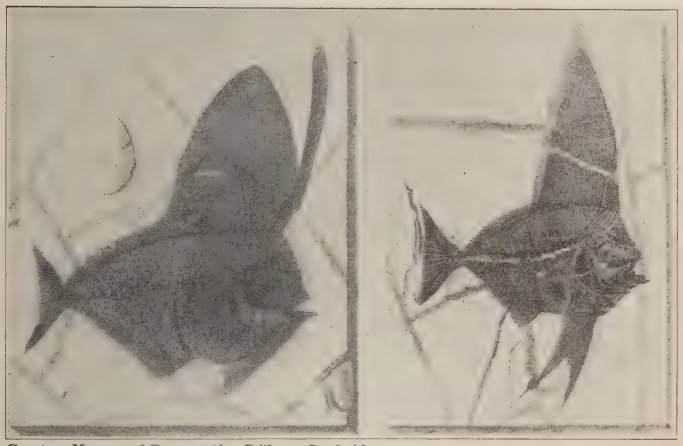
In 1859, the year that he went to Europe, the corner-stone of the Museum of Comparative Zoology was laid, and he was a happy man. His children had come to him from Europe. A second marriage — his first wife had died some years earlier — had given him a home again. The wise and gracious woman who had become his wife had taken the question of finances into her own hands, and had opened a school for young ladies. Of course students flocked to her doors. Who would not when Agassiz himself was teacher of science?

Agassiz loved to teach. Far above all his academic titles he prized the name of teacher. He was a busy man. "How can any one wish to kill time?" he once exclaimed. "Please give me the hours which you say are a bore to you, and I will receive them as the most precious of presents." He never had an extra dollar in his pocket, but he "had not the time to make money," he said when an opportunity was offered to him.

Agassiz's teaching always began with making sure that his students knew how to use their eyes. One of them says that on his arrival at the laboratory, the Professor took out a fish from some bad-smelling alcohol and laid it before him, telling him to study it. He studied ten minutes, one hour, two hours, all the afternoon; but when the Professor came and heard what the student had to report, he looked disappointed and said, "But you have not looked very carefully. Look again, look again." In the morning the Professor heard what the student had seen, and this time he said, "That is good"; but when the rather elated young man asked, "And what shall I do next?" he received the reply, "Just study your fish." Three days more of study of that wretched fish, and he had learned to look.

Agassiz was always in need of money for his plans, but he could get appropriations from the Massachusetts Legislature when every one else failed. When he asked for money for the Museum, two farmer members were overheard discussing the matter. "I don't know much," said one, "about

the value of this Museum as a means of education, but of one thing I am certain — that if we give Agassiz the money, *he* will not make a dollar by it." When a summer school by the ocean was proposed, he went straight to the Legislature. His appeal



Courtesy Museum of Comparative Zoölogy, Cambridge

ONE OF THE ILLUSTRATIONS FROM AGASSIZ'S "FOSSIL FISHES"

This represents the fish of which the scientific name is *Semiphorus velifer*. At one time this fish was supposed to be related to the Horse Mackerels, but the best authorities to-day consider it the type of an extinct family. The locality around Verona, Italy, is famous for these fossils; they date from the Eocene period, which was millions of years ago. In this picture the fish is reduced to about one eighth its size.

was published, and John Anderson, a wealthy merchant of New York, offered him the little island Penikese, in Buzzard's Bay, and a gift of $50,000 for fitting out the school. The buildings already on the island were a house and a barn; and in the barn as a lecture-room the teacher and his students gathered together. Long before this Agassiz had

said, "I never make the preparations for penetrating into some small province of Nature, hitherto undiscovered, without breathing a prayer to the Being who hides His secrets from me only to allure me graciously on to the unfolding of them." As he now stood before his students in the great barn, with swallows flying about overhead, little waves lapping on the shore, and sea-gulls sweeping down to their nests among the pebbles along the beach, then, as Whittier words it in his poem,

> "Said the Master to the youth,
> 'We have come in search of truth,
> Trying with uncertain key
> Door by door of mystery.
>
>
>
> On the threshold of our task
> Let us light and guidance ask,
> Let us pause in silent prayer!'"

Agassiz had already shown signs of serious nervous breakdown, and not many months after the summer at Penikese the end came. He lies buried in beautiful Mount Auburn. At the head of his grave stands a boulder brought from the glacier of the Aar, near where his hut once stood. It is shaded by pine-trees which came from his beloved home in Switzerland.

Another memorial is the great Museum of Comparative Zoölogy, in Cambridge. When Agassiz first entered upon his professorship at Harvard University, the specimens which he was so rapidly collecting were kept in a tumbledown shanty resting

on four piles in the Charles River. The roof leaked, and the walls threatened to drop to pieces; but here the collection grew. Before long it was stored in an old building on the college grounds, and the college appropriated a small sum each year for its care. This was not nearly enough, and Agassiz was happy when a legacy of $50,000 was left for the establishment of such a museum as he wished. Other gifts were made by private parties, by the University, and by the State. In 1860 the Museum was dedicated. To Agassiz's son had been given the position of "Agent," or business manager of the Museum with special care of the Radiates. Specimens came in from all parts of the world. They must be cared for and arranged, and exchanges with other museums must be attended to. When Agassiz died, in 1873, he could feel that already the Museum was in some departments the first in the world.

Alexander, his son, was determined that his father's hopes should be realized, that a museum should be built up which "would above all things furnish facilities for original investigation and advanced work." His own contributions amounted to more than $1,500,000, to say nothing of the greater part of his time for many years, badly as this interfered with his own scientific studies and business affairs.

The Museum building has developed from a single edifice to a structure covering three sides of a square and with a frontage of nearly four hundred feet. Of the collection itself, Wallace, the famous Eng-

lish naturalist, declared some years ago that "as an educational institution for the public, for students, and for the special investigator," the "Agassiz Museum," as people rightfully insist upon calling it, was superior to the British Museum.

But neither the great Museum in Cambridge nor Agassiz's long list of invaluable works, published in English, French, and Latin, has been of such service to our country as the influence of the man himself. He was the ideal teacher, and he taught not only those who gathered in his laboratory or listened to his lectures, but the nation as a whole. From New England to California he aroused a taste for scientific study, and he showed how that taste might be nobly gratified. He taught how to study Nature, how to love her intelligently, how to reverence every created object as an expression of the thought of the Creator. However far our students may progress in science, they will never find that the methods learned from Agassiz are obsolete or outworn, for they are founded upon truth itself.

JULIA WARD HOWE

AUTHOR OF THE "BATTLE HYMN OF THE REPUBLIC"

1819–1910

1861, wrote the "*Battle Hymn of the Republic*"

If ever a child was brought up with strict regard to proper behavior and training and instruction, it was the little Julia Ward, of New York, or "Miss Ward," as she was called almost from her babyhood.

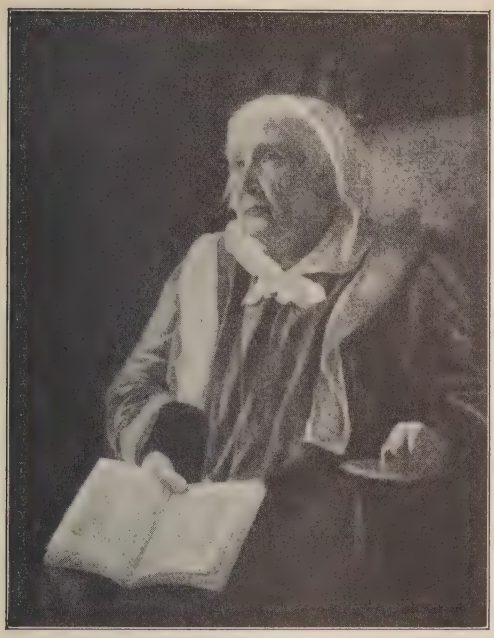
She must have been a most obedient little lady, according to a story which she herself tells. "We are going to call on an Indian chief this afternoon," said her mother, "and you must remember to be very polite to him." They drove to the Indian encampment, the little four-year-old Miss Ward keeping fast hold of a big twist of tobacco tied with a blue ribbon, which she was to present to the chief. She was bent upon doing everything she could to please him, and when the tall, dignified Red Jacket came to the carriage, she threw her arms around his neck. She was deeply grieved afterwards when she was told that this was not quite according to Indian customs. What Red Jacket thought of her greeting has never been known.

Little Miss Ward's father educated his children with the utmost care. They were first taught at home by governesses and masters; but when the

child was nine years old her dolls were taken away from her, for "Miss Ward is now too old for dolls," she was told, and she was sent to school. School in those days was in great degree a place for memorizing various books. The little girl had a good memory, and therefore she was put into a class using — or rather learning to recite *verbatim* — Paley's *Moral Philosophy!* It is no wonder that in contrast the study of languages seemed to her a delightful occupation.

The best of music-teachers were engaged by Mr. Ward, and, expressly in view of the benefit to his children, he bought a number of the best paintings that could be found in New York. He was so afraid of the effects of fashionable society on young people that the Ward children's only outings were the festivities at the home of their grandfather. A dancing-teacher came to the house, but they were never allowed to attend dancing-school with other children.

The home of the Wards was a meeting-place for literary folk. It was charming with good music, brilliant conversation, and delightful people; but the daughter saw little of general society until two years after her father's death. Then came a season of social life, and after that a visit to Boston, a momentous visit, for here she met Dr. Howe, whom she afterwards married. She had been carefully shielded from scenes of suffering, and had lived in a little world of books and study and music and interesting people; but Dr. Howe was intensely



Julia Ward Howe

Mine eyes have seen the glory of the coming
of the Lord
He is trampling out the vintage where the grapes of
wrath are stored
He hath loosed the fateful lightning of his terrible
swift sword
His truth is marching on.

PORTRAIT AND AUTOGRAPH OF JULIA WARD HOWE

With a facsimile of several lines from "The Battle Hymn of the Republic." The reproduction of the handwriting is slightly smaller than the original

eager to be of service to all who were in need, and she soon began to realize the many calls for help and sympathy.

During the first year of the Civil War Dr. and Mrs. Howe made a journey to Washington. That was the time when the Confederate forces were so near that the Army of the Potomac was kept encamped between them and the capital. The air was full of war. Soldiers were guarding the railroads; four-horse ambulances were rushing through the streets; officers and orderlies were galloping at full speed from point to point. Thousands of men had offered their lives to help save the Union, and she was doing nothing. What could she do? She could not leave her little children to go to the hospitals, even if she had had skill in nursing. She knew well that many a woman with only half her intellectual ability could accomplish far more than she in the practical work of making ready and packing the sanitary stores so greatly needed. She said to herself sadly, "You would gladly help, but there is nothing that you can do."

With such thoughts as these she went one day to see a review of United States troops. Suddenly, a command was given, and the review was broken off. The Confederates had made an unexpected move, and the regiments were ordered to return to their cantonments. The roads were full of marching troops, and the carriage of the Howes and their friends had to go at a snail's pace. It was a slow and wearisome drive, and to make it seem shorter

they sang one after another of the war songs of the day. The soldiers were appreciative. "Good for you! Good for you!" they shouted. Last of all, the air rang with

> "John Brown's body lies a-mouldering in the grave,
> His soul is marching on."

"That's a stirring tune," said one of the party to Mrs. Howe. "Why don't you write some good words for it?"

"I have often wished to do so," she replied.

Henry Ward Beecher used to say that he did his work while he was asleep, and this is what Mrs. Howe must have done; for that night, in the early gray of the morning, she woke and, as she said, "The long lines of the desired poem began to twine themselves in my mind." She scrawled them in the twilight, hardly looking at the paper. As she went back to her bed, she said to herself, "I like this better than most things that I have written" — which was mild praise for the glorious *Battle Hymn of the Republic*.

The "Hymn" was published in the *Atlantic Monthly*, and soon it was sung in the camps and even in Libby Prison. It is a stern and rousing call to battle, to warfare in the cause of freedom and justice and the everlasting right. No army sent out to strive for lands or wealth or military glory could ever march forth singing that song.

One of the author's friends said, "She ought to die now, for she has done the best she will ever do."

Nevertheless, Mrs. Howe did not die, but lived half a century longer, interested wherever she thought reform was needed — in woman suffrage, prison management, and the peace of the world. She wrote, lectured, preached, presided over important meetings. She was a power for good wherever she went. Her other work will never lack appreciation, but it is the *Battle Hymn of the Republic* which has touched most deeply the hearts of the whole American people.

GEORGE THORNDIKE ANGELL

KNIGHT OF KINDNESS TO ANIMALS

1823–1909

1868, organized the Massachusetts S.P.C.A.

In 1846 a young man in Vermont said good-bye to his mother — "No man ever had a better mother," he wrote of her in later years — and climbed into the night stage on his way to Boston. He had been left fatherless when a boy, but his mother was bent upon his going to college, and by the efforts of both he had just graduated from Dartmouth. He had tried in vain to find employment. No one seemed to need him, and now he was setting out for Boston to see what he could do there.

He wanted to study law and to support himself while he was about it. A good uncle offered him a home and a place in his law office; a cousin helped him to get a position to teach, and offered him the use of his law library. The way was now open, nothing but hard work was needed, and this he was more than willing to supply. For three years he taught days and studied nights and vacations. He must have managed his finances as economically as his time, for during those three years he paid with interest the two or three hundred dollars that he had borrowed while in college, helped support his mother and saved about twelve hundred dollars. He was a capitalist now, and could give all his time to

studying law! Two years later he was admitted to the bar. For twenty-three years he devoted himself to law. He was able to provide his mother with everything that she desired and to lay up a comfortable amount of money.

Mr. Angell had unusual ability to secure the rights of his clients and at the same time to win the friendship of their adversaries. A certain famous musician was always in debt, and often when he appeared in Boston Mr. Angell was engaged to collect claims against him. When the last claim had been paid, the musician presented him with tickets for the whole opera season, shook hands in friendly fashion, and said, "Now, Mr. Angell, if you ever have another claim against me, I wish you would tell me, so that I can run away."

Some of Mr. Angell's legal methods were as original as they were effective. A Chicago lawyer had collected a large sum of money belonging to an estate which the Boston lawyer was settling, and apparently the Chicago man had no idea of forwarding the money. Mr. Angell wrote that he would wait a certain number of days. If the money had not then come to hand, he should write to every member of the Chicago bar, asking if they could give him any advice about how to collect it. The money came. He could fight, and fight hard, if he had to; but he always preferred settling difficulties peaceably if he could.

This busy lawyer was doing his best to secure justice for people; but he was realizing more and

more that some of these same people were often treating animals with injustice and cruelty. He had always been very fond of animals — dogs, horses, cats, cattle, sheep, birds. One of the earliest remembrances of his boyhood was of being reproved for stopping on his way to church to pat a stray dog. Now when people went to meeting in the eighteen-twenties, they were expected to put on their best clothes and proceed to the church with soberness and decorum; they were not expected to stop and pat dogs. "Come, George. What will people think of you?" asked the small boy's mother, and he obeyed, but rather unwillingly, it is to be supposed.

Whenever Mr. Angell had seen any one being cruel to an animal he had always interfered; but he had heard of many cases of cruelty when it was too late to interfere; what could he do?

First of all, he made his will. He believed that the way to have the world full of kind people was to teach the boys and girls to be kind; so he willed that a large share of his property should go to distribute in schools and Sunday Schools books and pamphlets about the rights of animals, how to treat them properly, and how to make friends of them.

This was good as far as it went, but he became more and more unwilling to sit by and do nothing while animals were suffering so terribly. Young calves were carted through the streets of Boston "piled on each other like sticks of wood." Sheep that had been sheared waited, half frozen, in the

slaughter-yards, sometimes for a number of days, before they were killed. "A man in my town," said Mr. Angell, "who had mortgaged his stock of cattle to another, quarreled with him, locked the stable doors, and starved them all to death in their stalls to prevent his getting his pay." Every one knows what would be done with such a man to-day. The matter would be reported to the S.P.C.A. and he would be promptly prosecuted and punished. But at that time there was no S.P.C.A. in the State. What then could be done? Just nothing at all. A man could be as cruel as he chose, and there was no law in Massachusetts to punish him.

There was a man in Massachusetts, however, who knew what laws there ought to be, and before long something happened which made him too indignant to remain quiet any longer. This "something" was a race between two of the best horses in the State. They were driven from Brighton to Worcester, forty miles, over rough roads, each drawing two men; and both horses were driven to death. When Mr. Angell read the account of this in the paper, he said to himself, "Somebody ought to take hold of this business," and added, "and I might as well as anybody."

He wrote, over his own name, a letter to the daily paper in which the account of the race had appeared, saying that it was high time to stop such cruelty to animals. He knew that in New York two years earlier Mr. Henry Bergh had founded a "Society for the Prevention of Cruelty to Animals," and had

succeeded in having it incorporated. People had opposed him and laughed at him and sworn at him, had ruined his clothes and thrown filth in his face, but he had persisted, and this Boston friend of the helpless intended to persist. "I, for one," he said in his letter, "am ready to contribute both time and money." He declared also that he would be glad to unite with any others who were interested in the matter. This came out in the morning paper, and before noon six prominent people of Boston had called upon him and letters had come from three others. A few weeks later, in March, 1868, the Massachusetts S.P.C.A. was organized.

No one who is not a bully and a coward will hurt an animal that is in his power; but since there are bullies and cowards in the world, strong laws to protect animals are necessary. The first things to be done were to get such laws passed, increase the membership of the Society, and secure funds to work with. Some bright man suggested that there were excellent men on the police force who could perhaps be spared for a while to canvass the city. The mayor and the chief of police were approached, and they permitted seventeen officers, all in their best uniforms, to go from house to house, telling people about the new Society and asking for contributions and members. This was a fine stroke of business, for many listened to men in the city's uniform who would have turned away from any one else. The result was twelve hundred new members and thirteen hundred dollars added to the treasury.

The Society was now six weeks of age, old enough to publish a paper, its founder thought, and two weeks later the first number of *Our Dumb Animals* came out, and two hundred thousand copies were distributed throughout Massachusetts. In 1921 its circulation was nearly fifty thousand a month, and it had subscribers in practically every country in the world.

After a year of busy work Mr. Angell went to Europe, partly for rest and partly to visit the societies for the protection of animals and to do what he could to help them. Maybe the animals themselves recognized their friend. At any rate, he wrote home with great pleasure that while visiting the picture galleries of Versailles, he went for dinner into a little restaurant outside the palace grounds. His table had places for four, and pretty soon a big dog took the place on his right, another stood opposite him, and a handsome cat quietly seated herself in the chair at his left. "They accepted my hospitality," he said, "and we four dined pleasantly together."

Mr. Angell gave up his large law practice and went from place to place, founding new societies and telling of the work to whoever would listen. Some people listened because they loved animals and appreciated them. Others approved of his efforts from a sense of justice. Others could be moved by nothing except their own selfish good. They cared nothing for the sufferings of animals, but they did care if they themselves were in danger of sickness





Courtesy of Our Dumb Animals

Work Horses on Vacation

Mr. Angell's work for the humane treatment of animals led to the establishment of the Massachusetts Society for the Prevention of Cruelty to Animals. In addition to the hospital where horses, dogs, cats and other animals can be sent for treatment, the Society maintains at Methuen, Massachusetts, a Vacation Farm where work horses can be turned out to pasture. They seem to enjoy their vacation quite as much as people do.

from eating the flesh of an animal that had suffered. Still others looked upon the whole business as sentimentality, and a fine subject for their silly jesting.

In 1873 he asked permission to address the Convention of Massachusetts Teachers to meet in Worcester. The president replied cordially, but when Mr. Angell reached the hall he was kept waiting until 9 P.M. Then, when the people were putting on their wraps to leave, it was announced that "a gentleman wishes to address the convention on cruelty to animals." The audience had been listening to lectures and addresses all day long, and now they were invited to stay another hour and listen to some unknown man about cruelty to animals! They shouted with laughter from one end of the hall to the other.

Mr. Angell was thoroughly aroused. He told them that Agassiz, greatest of their profession, firmly believed in the immortality of animals. He told them of the dangers they themselves were running of eating diseased meat. Then he showed that the cruel child is likely to become the criminal man, and told them that it was their work, as teachers in the public schools, to save the boys and girls in their care from such a fate. Perhaps he spoke all the better for his indignation. At any rate, people listened till the very last word.

Every case of cruelty that is reported to the M.S.P.C.A. is investigated immediately. Animals too feeble to work are humanely destroyed. Men

who are persistently cruel are prosecuted; and prosecution by the M.S.P.C.A. is pretty sure to be followed by conviction and punishment. A recent report of "the Society" for a single month reads, "Prosecutions for cruelty, 33; convictions, 31."

Mr. Angell established Bands of Mercy among children. The motto of these Bands is, "I will try to be kind to all living creatures and try to protect them from cruel usage." Already, 128,444 have been formed.

Mr. Angell's work was not limited to care for animals. He fought for kindness to children, for pure food, for cooking utensils whose enamel was not made of poisonous materials, and for many other good causes. He was always ready wherever a helping hand was needed. He lived until he was eighty-six years old, and he was as enthusiastic in his last days as when he began his work. Often in the night he thought of so many things that ought to be said or done that he would sit up in bed and make notes by the dim glow of the night lamp of what must be done on the following day or said in his next address.

One of his dreams was of a hospital where suffering animals could be wisely and kindly cared for; and after his death the Angell Memorial Hospital was built in Boston, a hospital which is just as complete in its arrangements as any hospital for people. It was opened in 1915, and in the first five years of its existence nearly forty thousand animals were treated, half of this number in the free dispensary.

LUTHER BURBANK

PLANT-BREEDER

1849–1926

1875, perfected the "Burbank Potato"

LUTHER BURBANK when a young man spent some little time in his uncle's machine shop in Worcester, Massachusetts. He did not like it so well as outdoor life, but he did his best; and his "best" was to invent a machine that enabled him, doing piecework, to make from ten to sixteen dollars a day instead of the half-dollar that he had been receiving. Now came the struggle. He loved flowers and plants, and he felt sure that the life-work of his choice would be among them. His friends, however, were equally sure that he could become a rich inventor. Which should it be? He decided in favor of plants. He left the factory and set to work on a bit of ground belonging to his family, raising vegetables for market; but he did much more than to plant and cultivate and sell, for he studied the plants and thought about them and about what he believed they could be led to do.

Among his vegetables he raised some Early Rose potatoes. This had been an excellent potato, but it seemed to have run out. Indeed, potatoes in general were becoming so poor that some people thought there would be a potato famine before many years had passed. The Early Rose had never been

known to bear seed-balls, but one day the gardener found on a plant a single ball. Now, if the eye of a potato is planted, the same variety will be raised; but if the seed is planted, the result is quite different. There was a chance that he might get a much better potato than the Early Rose.

He did; he got the famous "Burbank potato." A great deal of money was made out of it, but not by Burbank himself, for he, like Agassiz, "had not time to make money." He gave his product freely to the world. The humble potato was a princely gift, for, according to a member of the Department of Agriculture, the income of American farmers is $17,000,000 a year greater because of this plant. He sold his discovery to a seedsman, and with the hundred and fifty dollars that he received, he went to California.

Before long his money was gone. He was sick and lonely, and the young man who, as time would prove, had given millions to the world was almost starving. A kind woman, richer than he in that she owned a cow, offered him a pint of milk a day, all that she could spare from her children. He refused for fear he would never be able to pay her. She insisted, and perhaps saved his life.

For a year he did any kind of work that would give him food and a place to sleep, but after a while he was able to get a bit of land to work on and carry out his idea. It was a very definite idea, namely, to make the food of the world better and more plentiful.

He was not aiming at making money. "No man ever did a great work for hire," he declared in later years; but he needed money in order to carry on his work. Before long his opportunity came. A man wanted to set out a prune orchard of twenty thousand trees, and he wanted them in nine months. To grow a prune-tree large enough to plant had always taken two or three years. Much to the surprise of the planter, the young man took the contract. He knew what he could do, and he knew what Nature would do if she were given a chance. The almond was the fastest-growing tree that would answer his purpose, so he engaged every man and boy that could be found to plant almonds. Just as soon as the young trees were large enough, he budded them with twenty thousand prune-buds. At the end of the nine months the prune-trees were ready; and the orchard is still bearing generously.

At length the nursery began to pay, and in 1893 he could count upon an income of ten thousand dollars a year. Most "level-headed" men would have advised him, as did his friends, to appreciate a good thing when he had it, and develop the business. Again he had to choose between money and work, and again he chose work, real work, for fourteen hours a day was his average working time.

Just what was he doing? In the first place he was improving many of the grasses, trees, vegetables, and flowers that we already have; and in the second place, he was developing new ones. He did this by breeding; that is, by uniting plants of different



AN EXPERIMENTAL FARM AND ORCHARD

Mr. Burbank's pioneer work in originating new varieties of plants and the improvement of old ones, has led to more scientific farming on the part of individuals, and the establishment of agricultural experiment stations at various state colleges and universities, and elsewhere.

species and producing new ones which were unlike them, and better. The stamens of a flower produce pollen, and the wind carries it to the pistil of some other flower, where it grows and forms seeds. Bees

gathering pollen for honey get it on their wings, and when they go to the next flower, it rubs off on the pistil, and seeds are formed. Mr. Burbank got up as early as the bees and did this work before them, to combine the best qualities of various superior plants which he had selected for the purpose. The seeds were planted, and from hundreds or thousands of the little plants, he selected a few, sometimes only one or two.

This breeding and selecting does not sound like a particularly difficult thing to do, and it was not — for Mr. Burbank. He seemed to have a natural understanding of plants that was lacking in other people. He could pass by five hundred with scarcely a glance, and fix upon one; and that one would be the only one for his purpose. He never worked blindly, leaving it to chance to bring forth something worth while; he always had a definite aim. He decided how a plant could be improved, and then went to work to bring the improvement to pass. The well-known Shasta daisy is a good illustration of his method, and of his kindly feeling for what we call "weeds." "There is not a weed alive," he said, "but what will sooner or later respond to good cultivation and persistent selection." The white field daisy of his Massachusetts home, hated by farmers because it did not suit the taste of horses and cattle, seemed to have been one of his favorites. At any rate, he meant to see what could be done to give it a long, slender stem, much larger blossoms, and rays of the purest white. The Massachusetts daisy was a

vagabond; it was not easy to kill it out, as the farmers knew, and it was small. In Japan there was one that also was small, but it had snow-white rays. In England there was a much larger daisy with an especially strong stem.

These three he combined; then patiently, year after year, he watched and worked, choosing each season the flowers that came nearest to his ideal. At length he was satisfied; the magnificent Shasta daisy was a success. But the work was just begun. He would not sell a new plant until he had made it as far as possible climate-proof and "fool-proof." It must be taught to flourish in heat and cold, and with only the indifferent care that most persons would give it. This was accomplished, and then the new Shasta daisy was ready to enter the polite world.

But many people who know the Shasta daisy, the sweet-scented verbena and calla lily, and the dahlia with the fragrance of the magnolia, have heard less about Mr. Burbank's more practical work. He never forgot his aim to make food better and cheaper, and, as in the case of the daisy, he sent all over the world, if necessary, for plants that possessed the qualities needed. The results are marvels. From the hardy little beach-plum, bitter and worthless unless cooked, he produced a large, sweet, rich plum without bitterness, and as ready as the beach-plum to grow in any soil, no matter how poor. He grew plums without stones; the canning cherry which thoughtfully leaves its stone

on the tree; the quince with the flavor of a pineapple, and mellow enough to be eaten raw; corn which bears many ears instead of one or two. He increased the size and improved the quality of several kinds of nuts and almonds. He showed plants how to do their work better and faster and how to do more of it. Cherries can now be raised several weeks earlier than formerly. His cross between an English walnut and a California walnut resulted in a tree that produces about twelve times as much timber, valuable hard wood, as either of its ancestors could have done in the same time, to say nothing of the great yield of nuts. He persuaded the chestnut-tree to bear nuts when only a year and a half old.

Mr. Burbank removed briars and prickles, and he made even the thorny cactus an agreeable member of society. It was juicy, an excellent food, and it was happy growing in the hot, rainless desert; but it was covered with thorns; and no one who has ever had the experience will forget how it feels to take hold of a cactus by mistake. Mr. Burbank chose a species which had thorns without number and leaves containing so much woody fiber that they were not very digestible. On the other hand, it would grow in the heat of the desert, and would also endure quite severe frosts. With this he crossed a cactus of fewer thorns, another of less woody fiber, and so on. He bred and selected until he had a thornless cactus which is a rich food for cattle. Its fruit is of a delicious flavor and may be

eaten fresh or preserved. Moreover, it will grow freely upon what are now desert lands.

Mr. Burbank was once asked what he considered his most important accomplishment. He replied thoughtfully:

"The 'Burbank' potato was the first thing which I introduced, but not by any means whatever the most important, although there have already been enough of these raised to load a freight train to reach fourteen thousand miles. Yet the forty new kinds of plums which I have introduced and which are shipped by the million boxes East each season, and my new commercial grasses, grains, vegetables, trees, berries, and hundreds of other things are of infinitely greater importance than the potato. But among such a multitude it is impossible to tell which is the most important. In fact, it may take fifty years yet to decide, but I can tell you, very plainly and very briefly, just what my most important work has been. It is simply this: that I have educated the world to the fact that plants are pliable and amenable to the will of man and can be improved beyond the dreams of any of the older growers, thus making it possible for millions to inhabit the earth where only thousands could before."

If Mr. Burbank had handled his creations solely to make money, he would have been a multi-millionaire, but he would not have been what he would call a successful man; that is, a man who aims to do, as the old saying puts it, "all the good you can to all the people you can."

During Mr. Burbank's lifetime, every one who went to California wanted to see his grounds, and even more to see him. Many of these visitors he would have been glad to meet, but, like Edison, he felt that special talents had been given to him, and his time must be devoted to his work. His cards of refusal, however, explained so courteously and regretfully why he could not admit visitors or grant requests for interviews that they left no sting.

ALEXANDER GRAHAM BELL

INVENTOR OF THE TELEPHONE

1847–1922

1876, first successful operation of the telephone

THE father of Alexander Graham Bell was deeply interested in phonetics; that is, the representation of sounds by symbols. All their short lives the Bell boys had heard a great deal about throat and lungs and vocal cords, and they were not at all surprised when their father said one day, "Boys, why don't you try to make a talking machine?"

They set to work, and with the help of a skull, a pair of bellows for lungs, and a tongue of rubber stuffed with cotton, they actually did manufacture a device that would say "Mamma" plainly enough to induce the neighbors to come in and ask to see the baby.

This occurred in Scotland, where Bell was born; but before many years had passed he was in London, studying and experimenting on sound. On account of weak lungs he went to Canada. He improved in health, and in 1872 he became Professor of Vocal Physiology at Boston University, teaching the deaf his father's method of "visible speech." He was fortunate in his pupils, for Mr. Sanders, the father of one of them, offered him a salary, a home in Salem, and a cellar to experiment in. He was still more fortunate in another pupil, Miss Mabel Hub-

bard, a charming girl of fifteen, for she afterwards became his wife.

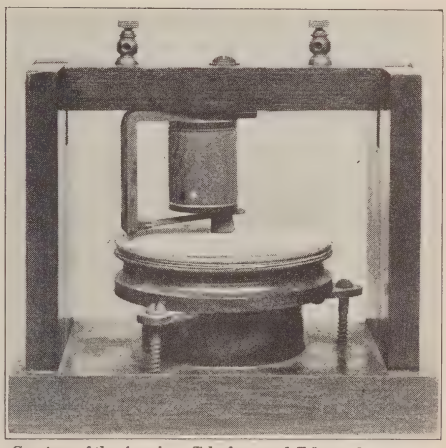
Bell was interested in what was spoken of as the "harmonic telegraph." Starting with the fact that if a note is sung close to the strings of a piano, the string corresponding to that note will begin to vibrate, more than one inventor believed that one might — if anybody could find out how to do it — send over a wire as many messages simultaneously as there are notes on a piano. Both Mr. Sanders and Mr. Hubbard, father of Miss Mabel Hubbard, believed that this was possible, and were ready to help the inventor financially to some extent. Before long, although he had not yet invented the harmonic telegraph, he had done some work worth patenting. From the beginning, Mr. Bell kept a firm grasp on his patents, for he had no notion of allowing any of them to be stolen from him. To see his attorney he had to go to Washington. While there, Joseph Henry, a well-known scientist half a century older than Bell, became interested in his work.

"You have the germ of a great invention," said Henry. "Keep at it till you have made a success of it."

"But I have not knowledge enough of electricity," said the young inventor with some discouragement.

"Get it, then," retorted the older man, and Bell returned to Boston to "get it." He had rented a top floor on Court Street and here he worked night and day.

Inventors have to get models made, and Bell went to a shop which was haunted by people of new ideas who needed such work. Here he met a skilled machinist named Thomas Watson. "One day when I was hard at work," said Watson, "a tall, slender, quick-motioned man with pale face, black sidewhiskers, and drooping mustache, big nose, and high sloping forehead crowned with bushy jet-black hair, came rushing out of the office to my work-bench." It was Alexander Graham Bell, and this was the beginning of a close connection between the two men, as Watson worked out in iron and steel the ideas of the inventor.



Courtesy of the American Telephone and Telegraph Company

PROFESSOR BELL'S EXPERIMENTAL TELEPHONE, 1875

This is a picture of the first instrument through which speech sounds were transmitted electrically.

They were struggling with the harmonic telegraph, but one evening Bell said: "I want to tell you of another idea I have which I think will surprise you. If I could make a current of electricity vary in intensity precisely as the air varies in density during the production of a sound, I should be able to transmit speech telegraphically."

This was the soul of the invention of the telephone, but to give it a body was no easy task. For months the two men struggled. Bell planned and Watson handled the tools. One hot June afternoon in 1875, they were in rooms some sixty feet apart, experimenting on the latest attempt. Suddenly Bell rushed into Watson's room, crying, "What did you do then? Don't change anything! Let me see!" Few people would have noticed that one of the group of instruments in use was yielding a slightly different sound from that given out by the others; but this slight difference and the trained ear that recognized it was the beginning of success.

It was nine months longer before the telephone would carry a complete sentence. Unluckily, the two men were not planning a dramatic scene for future narrators, and that first sentence was the very prosaic "Mr. Watson, please come here; I want you." Matters began to move rapidly, says Mr. Watson, but it was well into 1876 before the telephone could be depended upon in a conversation, and even then the sentences must be simple, and they often had to be repeated several times.

Having invented something and patented it, the next step is to get it before the public and induce people to invest their money in it. This was the summer of the Centennial, the best possible time, but it was not easy to get room at the Exposition to display the unknown telephone, a thing which many of those who had seen it pronounced to be a

mere toy. At length a bit of space between a stairway and the wall was given to Bell.

He had reached Philadelphia on the very day when the judges were making their official visits of inspection; but it was so late before they came anywhere near the staircase that some of them had already declared they were going home. Then something dramatic occurred, for the very wide-awake Emperor of Brazil, Dom Pedro, rushed up to the little table with the uninteresting looking box and greeted the inventor most heartily. He had, it seemed, once seen at Boston University Bell's work in teaching the deaf to speak. It does not take any unusual amount of imagination to realize the inventor's joy in having at last found a listener who was worthy of the invention. The Emperor wanted to

TELEPHONY.

AUDIBLE SPEECH CONVEYED TWO MILES BY TELEGRAPH.

PROFESSOR A. GRAHAM BELL'S DISCOVERY — SUCCESSFUL AND INTERESTING EXPERIMENTS — THE RECORD OF A CONVERSATION CARRIED ON BETWEEN BOSTON AND CAMBRIDGEPORT.

The following account of an experiment made on the evening of October 9 by Alexander Graham Bell and Thomas A. Watson is interesting, as being the record of the first conversation ever carried on by word of mouth over a telegraph wire. Telephones were placed at either end of a telegraph line owned by the Walworth Manufacturing Company, extending from their office in Boston to their factory in Cambridgeport, a distance of about two miles. (The company's battery, consisting of nine Daniels cells, was removed from the circuit and another of ten carbon elements substituted). Articulate conversation then took place through the wire. The sounds, at first faint and indistinct, became suddenly quite loud and intelligible. Mr. Bell in Boston and Mr. Watson in Cambridge then took notes of what was said and heard, and the comparison of the two records is most interesting, as showing the accuracy of the electrical transmission: —

BOSTON RECORD.	CAMBRIDGEPORT RECORD.
Mr. Bell — What do you think was the matter with the instruments?	Mr. Bell — What do you think is the matter with the instruments?

A Clipping from the Boston Advertiser

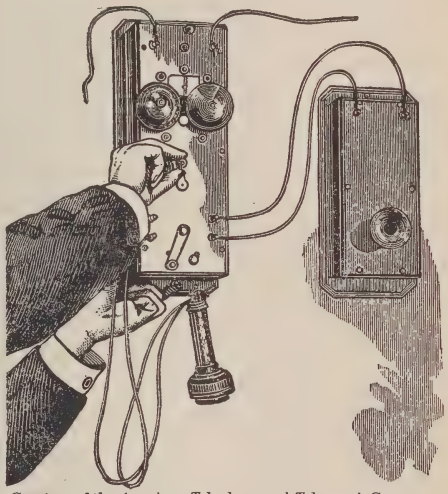
October 19, 1876

know every detail. Then he went to the farther end of the room and listened at the receiver. "My God," he exclaimed, "it talks!" Then came Joseph Henry and the other judges, not quite so tired as they had been. Most of the evening they talked and listened, and in the morning the little corner between the stairway and the wall was vacant, for the telephone had been carried away to the place of honor.

Even then no one realized the enormous practical value of the invention, and few people had much confidence in it. Still, money must be had. Luckily, everybody is curious to see a new thing, and from city after city came invitations to the inventor to lecture on the marvel. From one place to another he went, explaining what the handbills called the "wonderful and miraculous discovery," then illustrating its marvels by speech and songs given by Mr. Watson, twenty or thirty miles away, the sound being carried over telegraph wires leased for the occasion. When the lecture was to be given in New York City, they hired a colored man with a beautiful baritone voice to manage the musical end. Alas, the negro had no idea of crowding his lips and his voice into that little mouthpiece, and Watson had to take his place. Now Watson could be heard, but he was not a musical genius, and when he stopped singing, the negro asked, "Is that what you wanted?" "Yes." "Well, I could n't do *that*" — and he walked away, his head high in the air and an expression of utter scorn on his face.

People began to call for telephones. They wanted to buy them, but Mr. Hubbard, as business manager, refused to sell; all telephones must be leased. This piece of wisdom and foresight has made it possible to keep the system uniform and efficient.

It is not at all uncommon for a valuable invention to be so poorly managed from a business point of view that the inventor gains little by his work; but the interests of Mr. Bell were always so well guarded by his own carefulness in securing patents and by the skill and watchfulness of the management that he soon became a very wealthy man, with one home in Washington, another in Baddeck, Cape Breton, and the ability to have as many more as he might choose.



Courtesy of the American Telephone and Telegraph Company

A TELEPHONE OF 1882

Contrast this illustration with the simple telephone apparatus with which we are familiar. It will be seen that the telephone of early days comprised a separate ringing apparatus and transmitter. In order to call "Central" it was necessary to turn a switch, press a button, and revolve a small crank, whereas to-day all that we have to do is remove the ear-piece from the hook.

JOHN WANAMAKER

FOUNDER OF THE DEPARTMENT STORE

1838–1922

1876, opened the first department store in America

He was a very small boy, but he was big enough to "turn up bricks" in his father's brickyard so they would dry in the sun; and this was the way he earned his first money. The boy's name was John Wanamaker, and before many years had passed, he had become quite accustomed to turning over other things than bricks and to handling a good deal of money; but no sum ever looked quite so big to him as the pennies that his father paid him for his work in the brickyard.

When he was fourteen he asked a Philadelphia publisher for a place as errand boy, and won it, with $1.25 a week for wages. Then he took a place in a men's clothing store at twenty-five cents a week advance. He did his work just as well as he could, and was quite an ideal errand boy; but his brain was busy building air-castles. The proprietor of the store took a great fancy to him and used to invite him out to lunch for the amusement of hearing him talk about what he meant to do when he was a man. "I'm going to be a great merchant," he used to say earnestly; and then he would chatter away about his plans.

Next, John was made a salesman. Most of the

salesmen of that time were satisfied if they could induce customers to buy; but this salesman aimed at something better; he wanted them to be pleased with their purchases after they had reached home. The result was that people began to ask for him when they came to the store, and before long he had a large circle of customer friends.

Besides his duties in the store, John Wanamaker was deeply interested in Sunday-School work and in a society that had been formed only a few years earlier by some young men in London. This was the Y.M.C.A., and soon the earnest worker became secretary of the Association in America. He was a good patriot, and when the war broke out, in 1861, he tried to enlist, but was refused because of weak lungs. He meant to do something for his country, however, lungs or no lungs, and he helped with all his might in organizing the Christian Commission.

Meanwhile he had been saving as much of his salary as he could. Half a century later, he said: "The difference between the clerk who spends all his salary and the clerk who saves part of it, is the difference in ten years between the owner of a business and a man out of a job."

This certainly held good in his case, for before many years had passed he had two thousand dollars. His wife's brother had about the same amount, and the two young men set up in business for themselves.

The first thing they did was to agree to pay one third of their capital as annual salary to a salesman.

Most merchants would have said they were crazy to do such a thing, but the partners were in the right. The salesman was the best to be had, and he was well known in the city. The fact that they had engaged him looked as if they had started on a good foundation, and the wholesale houses were willing to let them have goods on credit. It was the best advertisement they could have had, and from the first Wanamaker believed firmly in advertising.

His advertising, however, was quite unlike the plain, old-fashioned way of merely stating that one had something to sell and people would be permitted to buy it; his notion of advertising was not only to tell what was for sale, but to set people to talking about it. And talk the good people of Philadelphia did! The Quaker City was aroused by flights of balloons and the published promise that whoever brought one back to Wanamaker & Brown would receive a suit of clothes free. Posters were once put up in the night, so that in the morning the whole city was ablaze with "W. & B." and people were questioning what it meant. Billboards were set up in prominent places. Wanamaker was original in whatever he did, and people soon began to talk about him, to wonder what he would do

The Philadelphia *Public Ledger* in describing the arrangement of this "new kind of store" said, "In the centre of the building is a circular counter ninety feet in circumference, which is devoted to the sale of silks. . . . Radiating from this are aisles 196 feet in length. These are intersected by other aisles running between the concentric circles of counters, on which are exhibited all sorts of articles that go to make up a large and complete stock of dry goods."



Courtesy John Wanamaker, Philadelphia

BIRD'S-EYE VIEW OF THE INTERIOR OF THE WANAMAKER GRAND DEPOT SOON AFTER ITS OPENING, 1877. (See note on page opposite.)

to-morrow — and also to visit his store and buy. Such methods are common now; but Wanamaker invented them and scores of others like them.

Before many years had passed he opened the first department store in the world. This does not mean merely that he had a variety of goods to sell; it means that the store consisted of a number of separate departments with a buyer at the head of each. The buyer was as independent as if he were in a store of his own. He bought what he thought best and fixed the selling price. Costs for advertising and general store expenses were divided among the different departments. Of course a careful record was kept, showing at a glance just what each one was doing. If any department failed to do well, there was a careful investigation to find out what the trouble was and how to improve matters.

Wanamaker had some very definite ideas of how a store should be run, and he laid down his principles and lived up to them. First of all, his store must be honest. Cloth, for instance, was often marked by "trade width"; that is, an inch or two more than it really measured. In the Wanamaker store "54-inch cloth" might turn out to measure 55 inches, but it would never measure 53. If goods was part cotton and a clerk in the hope of making a sale stated that it was all wool, that clerk was promptly discharged.

Second, all customers were to be treated with equal courtesy. If a little girl was sent to buy a spool of silk, just as much care must be given to

matching her sample as to an order for furnishing a house.

Third, the price of everything was to be the same to all, and it was to be marked in plain figures. It was quite the custom for clerks to charge a customer as much as they thought he could be induced to pay; and in many stores the surest way to win promotion was to succeed in transferring money from the pocket of the customer to the till of the merchant, regardless of fairness and justice. Of course having the price in plain figures would interfere with any such fashion of making sales, so cost and selling price were marked in cipher. To-day a few stores still keep up the old method of marking in cipher, but nearly all have learned that a large amount of trade comes from people who buy what attracts their attention in passing, and that they are much more likely to stop, look, and purchase if the price is in sight.

Fourth, any customer who was not satisfied with what he had bought might exchange it for other goods or have his money back if he preferred. He was not asked why he wished to return the goods; it was enough that he did wish it. Of course there were people who abused the privilege, as there always will be people who will abuse every privilege, but on the whole it paid, and paid well.

Fifth, whatever promise was made by the store must be strictly fulfilled. If an article was to be finished at a certain time, it must be finished at that time, and not half an hour later. In short, the

whole tone of the store was honesty and regard for the rights and preferences of the customers. The store has always been conducted on these principles. Its envelopes for goods bear to-day the legend: —

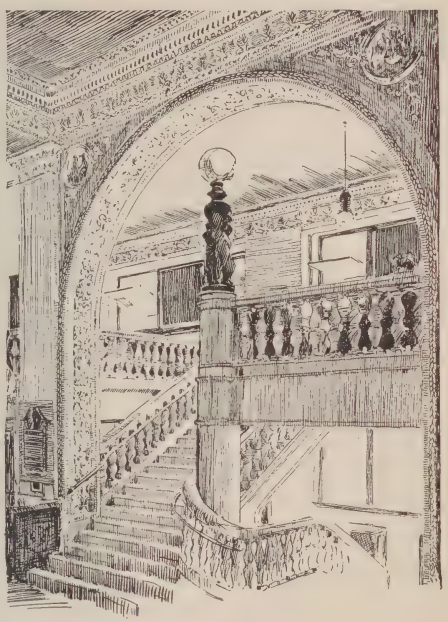
> "Trustworthy goods only
> Straightforward one price
> Exactness of all statements.

Wanamaker's advertisements made interesting reading. They did not sound as if they came from a store, but rather like notes of friendly advice. An advertisement of blankets, for instance, described their quality and texture, and then said: "These blankets are extra large. The part of a blanket that hangs over the edge of the bed, the part that you don't see any use in and don't want to pay for — that is what keeps you warm."

Wanamaker made a great deal of money, and he gave away this money generously wherever it seemed to him to be most needed. Churches, hospitals, schools, missions, clubs, all received help from his hand. More than that, he always gave freely of his time and thought. With so immense a business on his mind the value of an hour of his busy day can hardly be estimated; but over and over again he laid aside his vast business interests and gave his whole attention to some puzzling detail of a school or a library. What he did for the comfort and pleasure and education of his employees is "another story," and quite too long a story for a short article.

Wanamaker never lost his interest in his early friend, the Y.M.C.A., and besides his gifts to that organization in this country, he erected buildings for Association use in China, Japan, Korea, and India.

Another early friend of his was a little Sunday School which he organized in 1858, when he was twenty-one years old. It consisted of two teachers and twenty-seven pupils, and they met in a cobbler's shop. This small beginning grew into the famous Bethany Sunday School of more than three thousand members and two large churches, one of which was given by Mr. Wanamaker. He also built Bethany Temple, in West Philadelphia; and the three churches work together. They carry on a Penny Savings Bank, a Brotherhood House, a library, and numerous other



Courtesy John Wanamaker, Philadelphia

A Stairway in the Wanamaker Store, Philadelphia

helpful institutions. In all the rush of business life Mr. Wanamaker never gave up his Sunday-School class, and when he was Postmaster-General he returned to Philadelphia from Washington every Saturday afternoon that he might not be absent from it. His interest extended over the whole work of church and Sunday-School, and he frequently made ten or eleven informal addresses in the different departments in a single day.

Besides being a generous giver Wanamaker never failed to be a good citizen. He did his best to clean up political corruption. It was due in great degree to his efforts that Philadelphia has a good water supply; and when his city was about to sell the gas plant for much less than it was worth, Wanamaker quietly crushed the tricky schemes by offering to buy the plant at a far higher price. He never sought for office. There is little doubt that he might have had the nomination to the vice-presidency in 1912, but he showed no desire for it, although, when there was need for a business man to become Postmaster-General, he had accepted the position and turned the light of his business experience and ability upon postal methods. The result was, among other improvements, the establishment of the free rural delivery service, the sea post-offices, by which mail is distributed on the ocean steamers and much time is saved in delivery. He did his best to arouse the country to the need of the parcel post, the postal telegraph, and the postal savings banks.

"How did you do it, Mr. Wanamaker?" it is said that the merchant was asked. "You began with nothing, and now you have three great stores, in Philadelphia, in New York, and in Paris. How did you do it?" And the man who had succeeded replied, "By thinking, toiling, trying, and trusting in God."

"But was it not easier for a young man to succeed in the days when you began?"

"I think not," said Mr. Wanamaker thoughtfully. "The opportunities are much greater now and there are twice as many of them."

FRANCES E. WILLARD

TEMPERANCE REFORMER

1839–1898

1879, became President of the National W.C.T.U.

When Frances Willard was a little girl, she lived on a Wisconsin prairie, in a rambling cottage covered with roses and Virginia creeper. She and her brother and sister manufactured their own playthings, played "Indians," flew kites, formed an "Artists' Club," and also a "Rustic Club" with a lengthy list of complicated signals. They made believe that they lived in a city, and organized a government for its management. Horseback riding was forbidden to the girls until they were fifteen, but "Frank" trained a cow to draw her sled and at length to act as saddle-horse — when no one was looking.

Occasionally there was a prairie fire by way of excitement. These fires were generally harmless, but one Sunday, when the Willards came home from the little church four miles away, they found a neighbor's house in danger. The whole family ran with pails, and the house was saved.

This was thrilling entertainment, all the more delightful because it came on Sunday, and Sunday was rather a difficult day for children in the Willard home, for it was "kept" most strictly. One year when New Year's came on the first day of the week,

the presents were distributed Saturday evening, because it was not thought right to bring them out on Sunday. Among the gifts was a religious book for the brother and an illustrated *Pilgrim's Progress* for the little sister; and these, of course, they were allowed to read Sunday. But alas for Frank! Her present had been the desire of her heart, a big new slate, and she was not permitted to use such a week-day article until Monday. She endured the condition of affairs as long as she could, and then besought her mother, "*May n't* I have my new slate if I'll promise not to draw anything but meeting-houses?" She had the slate.

The children had books in plenty, an educated father and mother, an excellent piano, and music-lessons at the Wisconsin Institute for the Blind — which they called the "blind Institute," a mile away from their home. The mother insisted upon their having "nice, considerate ways," and both she and their father were the best of companions. The children were always happier to have them near. One day when the tired mother had gone to her room for a restful hour, small Frank followed with some children's papers. "I came, my dear, to be alone," the mother said gently; and the small child sturdily retorted, "It is natural that I should want to be with my mother, and I mean to be." She was not sent away.

The time came when the brother went to Beloit to prepare for college, and the girls called after him, "We've got a Yale graduate to teach us, and

Beloit can't beat that"; for they were going to a tiny schoolhouse that had just been built. They were so excited that they got up long before light, packed and repacked their lunch, sat waiting for a long time on the bobsled drawn by two big oxen, and were the first arrivals at the school. It was a happy, healthful life for the children, but they were growing up fast, and on Frank's eighteenth birthday her mother told her that she must not run wild any longer, but must "do up" her hair and wear a long dress. The girl yielded, but to her diary she wailed, "I can never jump over a fence again, so long as I live."

But she soon forgot the sorrows of long skirts and hairpins, for she and her sister were to go to the Northwestern Female College at Evanston. "My! can't she recite! That new girl beats us all!" the students said of Frances. She soon became editor of the college paper, and a leader not only in scholarship, but in every kind of clean fun. During the last year of her course she became a member of the Methodist Church in Evanston, Illinois, and her determination to do something worth while in the world was greatly strengthened.

In the middle of the last century an educated girl who wanted to earn money was expected to teach, as a matter of course, and Frances taught. Her first school was ten miles from Chicago. When she opened the door she found herself in a scene of warfare, for the big boys had spent their time of waiting for the new teacher in fighting and breaking

windows. They quieted down at her reading from the Bible, and their young instructor could hardly keep back a smile when she saw them a few minutes later singing with gusto, "I want to be an angel."

The home on the prairie was sold, and the family moved to Evanston. Mother and daughter lived together in "Rest Cottage"; alone, for father and sister had died and the brother had married. Frances continued her teaching. The invitation to become president of the Evanston Ladies' College came to her in 1871, while she was nailing down a stair-carpet. "Frank, I am amazed at you," said her trustee caller. "Let some one else tack down carpets, and do you take charge of the new college." "Very well," replied Miss Willard, "I shall be glad to do so. I was only waiting to be asked."

She was well fitted for the position. She had, on the invitation of a dear friend, just spent two years in European travel. She had done considerable literary work, and was becoming known as a contributor to magazines and papers. She was delighted with the opportunity to be a "big sister" to so many young girls. As to rules, when she herself went away to school a list of seventy had been laid before her. In the Evanston Ladies' College she announced at the beginning of each term that such rules as might be found necessary would be given one by one; but that until the need of a rule was shown, none would be given. She sympathized heartily with the wish of her girls to join the literary societies of Northwestern University. Imagine her

amazement — and amusement — when she found that objection to this was made on the grounds that it would be improper for young women to carry on debates with young men; that a girl might chance to be elected president of the society, a highly improper position for a girl to hold; and, worst of all, that every time a girl might speak it would deprive some young man of the opportunity for practice!

In 1874 came the Women's Temperance Crusade in Ohio. Miss Willard was deeply interested in this work, and made speeches in its favor so successfully that she was in great demand at temperance meetings. Before long she had a difficult choice to make. On the same day two letters came to her. One offered her a teaching position at twenty-four hundred dollars a year, equal to three or four times that amount to-day. The other was from one of the temperance workers in Chicago. "We are a little band without money or experience, but with strong faith," it said; and then asked if she would become their president.

In this position she would have no salary at all except her living expenses; but she promptly accepted. She had found her life-work, namely, to speak for temperance. Her "stint" was, as she said, to speak for the white ribbon throughout the United States, in every town and city of ten thousand inhabitants or more. Before the end of 1883 she had accomplished the task. She had also founded the Woman's Christian Temperance Union, and had become its president, as well as president

of the National Christian Temperance Union. On her lists were the names of fifteen thousand places from which invitations to speak had come to her, and which she had had to refuse for lack of time. In her early work for the Woman's Christian Temperance Union, her friends urged her to be "managed" by a lecture bureau. She yielded, for three weeks, but she must have almost driven her manager to despair, for she kept her price at twenty-five dollars, and over and over refused to accept more. "A philanthropist can't afford to make money," she declared.

She became strongly interested in the agitation for woman suffrage, because she believed that women voters would put an end to the liquor saloon. About the time of her being "managed," the white-ribboners of Illinois prepared a petition for the right to vote and presented it to the State Legislature. The list of names was a quarter of a mile long, and the members of the Rest Cottage household took turns in trying to iron it smooth. The petition was not granted, so was sealed and put away, not to reappear until the day should come of women's voting in Illinois.

The days were full of engagements and requests for every conceivable kind of help. People seemed to think that because she could make speeches, she could do everything else. One woman asked her to secure a patent for her on a new kind of rolling-pin. Another offered twenty-five dollars for her husband's appointment as postmaster. A young man

asked her to write his part in a debate on prohibition. A woman besought her to select a maid for her; and a young minister went a step farther, and begged her to choose a wife for him.



THE WILLARD FOUNTAIN IN CHICAGO

This fountain was presented to the city of Chicago in 1895. The cost was in the neighborhood of $2000, and this amount was raised by the Loyal Temperance Legion, the children's organization of the W.C.T.U., in contributions of nickels and dimes from children in all parts of the country.

On the platform she was perfectly at ease, and had a charming fashion of treating an audience like a personal friend. If something had pleased her she was sure to speak of it in her next "sermon." It was the same in trouble. When news of her brother's sudden death came to her she was on the point of taking the train to conduct a temperance prayer-meeting. "He would have wished me to do this," she said to herself. "And so I went, and told the people all about it, while we cried together, praying and talking of a better life, which is an heavenly."

She had the gift of eloquence, but even more winning than that was her confidence in the sympathy of her audience. She never said a word that would leave a sting; she always had "nice, considerate ways." In argument, even with those who opposed her most strongly, she was never bitter; for she always took it for granted that others were as honest in their belief as she was in hers. "All loved her," said a friend, "because she loved all. All trusted her because she trusted all." "Only the Golden Rule of Christ can bring the Golden Age of Man," was her motto.

So the days went on to the end of her life with the noble woman who had become such a power for good in the world. She was never jealous of the gains of others, never selfish, always eager to do her best. She said that "lying on the prairie grass and lifting my hands toward the sweet sky, I used to say in my inmost spirit, 'What is it — what is it that I am to be, O God?'" "I fully purposed to be one whom multitudes would love, lean on, and bless" — and she attained her noble wish.

In the Capitol at Washington is the National Statuary Hall. To this each State was invited to send statues in marble or bronze of two of its distinguished citizens. For one of her two representatives, Illinois sent a statue of Frances Willard.

CLARA BARTON

FOUNDER OF THE AMERICAN RED CROSS

1821–1912

1881, organized the American Red Cross

Not many miles from Worcester, Massachusetts, is North Oxford, and here, in a story-and-a-half cottage, which is still standing, there once lived a very timid little girl. On an Indian gravestone in a Philadelphia cemetery is the inscription "Annie Afraid-of-Bear," but this sensitive little Oxford girl was more timid than "Annie," for she was afraid of everything. By chance she saw the blow that killed an ox, and she dropped to the ground in a fainting fit. Horses alarmed her especially, for she was sure that some terrible accident would happen wherever they were.

This little Clara was the youngest of the family, and the special pet of the older ones. They could not understand her timidity, however, and occasionally they felt it their duty to give her a lesson. For instance, one day her brother David caught her up and tossed her upon the back of an unbroken colt. He jumped on another and galloped away, followed by the little sister's colt. She clung to the mane and did n't fall off. It was a severe lesson, but a successful one, for she was no longer afraid of horses.

Clara had pet cats and pet dogs; she fed the chick-

ens and the ducks; she milked the cows; she helped in every way that a child could. She had a free, healthy home life, but when she was eleven years old her freedom came to an end, for David had a severe fall and for two years was a bedridden invalid. Little by little the charge of the sick brother fell upon her, and she was a proud little girl when she found that he would rather have her care than that of any one else.

Four years later she put up her hair and let down her skirts, for she was going to Hightstown, New Jersey, to teach, and she must look as old as possible. Ten miles from Hightstown was Bordentown, and some of the people in Bordentown had a notion that public schools were "free schools for paupers," and would not allow their children to attend them. The result was that two thirds of the boys and girls of the place spent much of their time in the streets. Whenever an attempt was made to open a public school they had a fine time breaking it up.

Here was a chance for work, and whenever work was needed the young teacher was always ready. "Allow me to open a public school," she said to the people of Bordentown, "and I will teach for three months without salary." Her offer was accepted. She began her school in a tiny brick house with six pupils. In five weeks six hundred children wanted to get into the little building. Bordentown put up a new schoolhouse with eight rooms, and there was no more trouble about having public schools. The teachers and pupils of New Jersey have now bought

the little brick building, and plan to restore the interior so it will look as it did when Clara Barton taught within its walls, and preserve it as a memorial to her.

Miss Barton taught one school after another, and she learned bookkeeping in her brother's factory, and then she went to Washington and was appointed to a position in the Patent Office. She was the first woman to have such an appointment, and although the superintendent declared that she was the best clerk he had ever had, the other clerks were not pleased. To make things uncomfortable for her they used every morning to range themselves along the two walls of the corridor through which she must walk, and when she appeared they would begin to whistle and stare and make boors of themselves generally. She paid no attention to them, and then they tried slander. The superintendent heard of this, and before long a line of discharged young men marched sullenly down the steps of the Patent Office.

When the Civil War broke out, in 1861, and the first troops, the famous Sixth Massachusetts Militia, reached Washington, her only "Government appointment" was that she saw the need of help; but she went straight to the Capitol, where they were quartered, taking with her five stout colored men with baskets of food. This was the beginning of her war work. There was then no Sanitary Commission, no organized relief, and she begged to go beyond the lines. "That's no place for a woman,"



Photograph by Leet Brothers

NATIONAL HEADQUARTERS OF THE AMERICAN RED CROSS AT WASHINGTON, D.C.

growled the officials, but she won over the Assistant Quartermaster-General, and she went.

The timid little girl who had been afraid of her shadow had no fear of men or of cannon or of the sight of blood. "Do you think I will leave here *now?*" she demanded in the midst of a bombardment. Once when there were hundreds of wounded and no ambulances, she contrived somehow to get a tug, went to Washington, called up the Chairman of the Senate Military Committee in the middle of the night, and in two hours help was on the way. It is no wonder that the Surgeon-General gave her permission to do what she chose — but this gentle, quiet, low-voiced woman would have done it anyway if she had seen the need. She outranked everybody when there was work to be done. It was not until the last year of the war that she had any definite position; what she did was done by one-woman power.

After the close of the war thousands of letters came to her begging for her aid to find what had become of brothers and sons and husbands. She answered, as she always answered every appeal, "I will help," and for four years she carried on the search. President Lincoln's sympathetic heart rejoiced, and to help her in the work he gave her an official appointment. Two months later he was assassinated, but she would not stop. She organized a "Bureau of Records of Missing Men" at her own expense. "What is money to me if I have no country?" she had demanded when her friends had tried

to induce her to save for her own needs. As a result of her efforts, the graves of twelve thousand Union soldiers were named and marked in the National Cemetery in Andersonville, and the names of twenty thousand dead soldiers were given a place of honor on the Government records.

At length she went to Europe to rest; but her "rest" consisted of helping in another struggle, for France and Germany were at war. In Switzerland she learned about the Red Cross. "My country must have a Red Cross Society," she said, and as soon as she was able to get home and plead for it, the good work began. Perhaps she hoped that wars would soon be at an end, for she saw to it that the Society should aim at lessening suffering not only in war, but wherever else it existed.

She was made president of the organization, of course, and the story of the rest of her life is a record of service wherever service was needed. Whether it was flood, fire, famine, pestilence, earthquake, or war, the Red Cross was ready with workers and supplies, with system and experience and the helping hand. Cold, heat, danger were nothing to Clara Barton when there was work to be done for others. She had forgotten all about the fears of her childhood. More than once she had to fly for life or liberty on a strange horse in a trooper's saddle; but what she called her "baby-lessons" in riding the wild colt served her well, for, as she said, her seat on the back of a horse was "as secure as in a rocking-chair, and far more pleasurable."

In 1892 Clara Barton was called to respond to the toast, "The women who went to the field." The following is a part of her response:

"And what did they know about war, anyway?
What could they do? Of what use could they be?
They would scream at the sight of a gun, don't you see?
Just fancy them 'round where the bugle-notes play,
And the long roll is bidding us on to the fray!
Imagine their skirts 'mong artillery wheels,
And watch for their flutter as they flee 'cross the fields.
When the charge is rammed home and the fire belches hot;
They never will wait for the answering shot.
They would faint at the first drop of blood in their sight."

This is what was expected of women when Clara Barton first led the way to the front. What is expected of them now is shown by the records of the World War of 1914.

BOOKER T. WASHINGTON

FOUNDER OF TUSKEGEE INSTITUTE

1859–1915

1881, chosen first Principal of Tuskegee Institute.

HALF a century ago, when the Civil War was going on, a little black boy who lived on a Southern plantation was awakened early one morning by hearing his mother praying that some day she and her children might be free. Before many months had passed, all the slaves on the plantation were bidden to come to the "big house," where the master lived. They felt certain that something was going to happen, but no one could tell what it was; and all that night the black folk whispered together and wondered and guessed what might be coming.

In the morning the little boy Booker went with his mother and brother and sister to the "big house." On the veranda were the master and his family. There was also a tall man in a blue coat with brass buttons, who stepped forward and made a little speech and then read a long paper. The boy learned afterwards that it was the Emancipation Proclamation; but all he knew then was that his mother bent over her children and kissed them, with tears of joy rolling down her cheeks, and told them that they were free. Before long the boy's stepfather sent for them to come to West Virginia.

This little black boy had several times had a

glimpse through an open door into a schoolroom, where boys and girls sat studying, and there was nothing in all the world that he wanted so much as to go to school and learn to read. His mother contrived to get him an old spelling book, and somehow he learned most of the alphabet. After a while a school was opened, but the boy was sadly disappointed, for his stepfather said he must work and help support the family. Work he did, but in the evenings, after a long day of labor, he studied, and at length he was permitted to go to school for a while, provided he would get up early and work till nine, and also work two hours in the afternoon. When he was no longer allowed to go to school by day, he recited at night, sometimes walking several miles to his teacher's home.

One day he heard two men talking about a wonderful school in Hampton, Virginia, where a colored boy might be taught and also learn a trade; and just as soon as he could he set off for Hampton, five hundred miles away, and arrived with fifty cents in his pocket to pay for his education. He must have been a shabby-looking boy, for on the way he had slept under a sidewalk in Richmond, and he had spent several days earning money by unloading pig iron from a vessel. It was a question whether he would be permitted to enter the school, for so many applied that only the most promising could be taken. But the head teacher was watching him, and suddenly she said, "That recitation room needs sweeping. Take the broom and sweep it." Some-

how the boy felt that this was his entrance examination, and he rejoiced that he had once worked for a lady who had insisted upon the best possible sweeping and cleaning. He swept that room three times and dusted it four times. When it was done the teacher rubbed her handkerchief over the tables and woodwork about the walls, looked at the handkerchief and then looked at the boy, as he stood anxiously waiting. "I guess you will do to enter this institution," she said kindly. Moreover, she made him janitor, and so gave him the chance to work his way. It was not easy, for he had to be up at four every morning, but he was a happy boy, for now he was getting the education that he had longed for.

He was being educated not only in books, but in ways that he had never dreamed of. When the time came for making the building ready for the opening of school in the autumn, he was amazed to find that the head teacher, whom he looked upon as a superior being, was not only taking charge of the work, but was actually working beside him. This was a new idea; he had found out that work with the hands was not a disgrace, but that if it was well done it was something to be proud of.

After he graduated he went straight home to West Virginia and began to help his own people in his own village. He taught the boys and girls in the daytime and the older people in the evening. He established a small reading room and a debating society. He taught in two Sunday Schools — in-

deed, he helped in every way that he could, without any regard to whether he was paid or not.

Next came a call to return to Hampton as a teacher; then in 1881, General Armstrong was



Picking Cotton by Hand on a Southern Plantation

asked to recommend some one as principal of a normal school for colored people to be established in the little town of Tuskegee, Alabama. He recommended Booker Washington, and a few days later a telegram came which said, "Send him at once."

He had expected that, of course, there would be buildings and money to work with; but the money consisted of a grant of two thousand dollars a year from the State Legislature, which could be used for nothing except teachers' salaries, and the buildings

consisted of a shanty so tumble-down and full of holes that, when it rained, the teacher had to hear recitations from under an umbrella. As an assembly-room he was permitted to use a church. Not far away there was an old plantation for sale at five hundred dollars. He borrowed two hundred and fifty dollars, with many fears lest he should not be able to repay the loan, and made a first payment. On this plantation there was a kitchen, a stable, a cabin, and an old henhouse. These all had to be cleaned out, and the pupils took possession.

The people of Tuskegee, white as well as colored, were deeply interested in the school, and chiefly by their aid the land was paid for within five months. People of both races were equally pleased when it was decided somewhat later that a new building must be put up. It would cost six thousand dollars, and there was not a penny in the treasury; but the school had grown so much that without such a building it could no longer do its best work. Again white people and black people were ready to help. A white man who ran a sawmill near Tuskegee insisted upon providing the lumber. "Pay me when you can," he said. A colored man who had once been a slave brought a big hog as his contribution. "Any negro that's got any love for his race, or any respect for himself, will bring a hog to the next meeting," he declared.

The building was put up, and as the school increased more buildings were needed and more money. The whole burden of raising this money

fell upon Mr. Washington; and it is no small thing to be responsible for a large school and not know where the money for bills is coming from. It was doubly anxious work in this case, because, if it had failed, many people would have insisted that it was because the school had been under Negro management, and if ever asked again to help an institution of the kind, they would have refused.

Mr. Washington was very wise in his begging. He never annoyed people by teasing; he asked only the privilege of telling them what Tuskegee and its graduates were doing, and then left it to them to decide whether they wished to help in the good work or not. Sometimes they refused, but often he received more than he had hoped for. One wealthy man listened to his story, but gave him nothing. Two years later, however, this man sent him Tuskegee's first large gift, a check for ten thousand dollars. "I had placed this sum in my will for your school," the donor wrote, "but deem it wise to give it to you while I live. I recall with pleasure your visit to me two years ago."

It was 1881 when the school was opened. Fourteen years later there was held at Atlanta, Georgia, the Atlanta Cotton States and International Exposition. A special building was set apart to show what the Negroes had accomplished since they had become free; and Booker Washington was asked to make one of the addresses at the opening of the exposition.

On the appointed day he started for Atlanta.

"I felt," he said, "a good deal as I suppose a man feels when he is on his way to the gallows." And certainly it was no easy task to address Northern whites, Southern whites, and Negroes all together. "I am afraid that you have got yourself into a tight place," said a farmer friend to him. He thought so too.

Governor Bullock introduced him to the audience as "a representative of Negro enterprise and Negro civilization." Mr. Washington made an eloquent address, and at its close the Governor grasped his hand, and both there and on the streets afterwards, he was surrounded by crowds who were eager to shake hands with him. Now came offers from lecture bureaus and editors of magazines; but Mr. Washington replied simply that his life-work was to be at Tuskegee, and whenever he spoke in public it must be in the interest of the school.

This speech at Atlanta was the beginning of his public work. Long before his death, which occurred in 1915, his eloquence was recognized in America and in Europe. When he spoke, he never failed to "carry" his audience. Never did he show a trace of the self-seeking that would have weakened his influence. He was proudly entertained both in shanties and in the noblest palaces of Europe. Every one respected him and admired him. He had no enemies, for he was an enemy to no one. "No man shall narrow and degrade me by making me hate him," was the expression of his character.

The plan of his school was somewhat different

from that of ordinary schools. Mr. Washington's idea was that both black boys and white boys ought to get as much education of the brain as they could afford; but that the majority of the educated colored people could help themselves and their race more by entering business or industrial life. "There is as much dignity in tilling a field as in writing a poem," he said to them. That is why, although



A Pneumatic Machine for Picking Cotton

the course in "book learning" is as thorough as in any other school, a great deal of emphasis is laid upon industrial work. The students are required to work six days in each month, and no one is allowed to graduate who is not prepared to make in some way a living for himself and others.

Tuskegee teaches some forty different kinds of

industrial work. The girls are taught gardening, fruit-growing, dairying, bee-culture, sewing, etc. "Learn to make your services indispensable," said the wise founder. This teaching is most thorough, and the course in horseshoeing, for instance, is just as carefully graded as that in arithmetic. It begins: "The condition of a shoeing floor. How to make a shoer's fire. The name and use of shoeing tools. What a mould is and how to make it; also how to strike on a shoe," etc. The hoofs and lower joints of the legs of a dead horse are carefully dissected before the class, and they see for themselves how much harm a single nail improperly driven can do.

Not many students can afford to pay for tuition. That is why Tuskegee asks its friends for help. As for board, students can work that out, in part at least, for they are all paid for what they do on the school farm. Students have done the greater part of the work on the school buildings, even to making the bricks.

Mr. Washington did not forget the time when he could not have even one hour a day for school, and he opened an evening school for those who had no money for any part of their board. They work ten hours a day for their expenses, and study two hours in the evening.

Mr. Washington believed that graduating essays should be about things that the students had really done and really understood. One boy, for instance, brought as his "essay" a live pig up on the platform, and told the audience what he had learned

about the care of pigs. Another stood beside a pile of cabbages and told how he had prepared the soil and harvested the crop. Never before was a cabbage applauded so heartily as the big one that he held up for his audience to see. How to hatch chickens with an incubator, how to make cheese, how to give "first aid to the injured," have all been discussed on the commencement platform at Tuskegee.

Many of the audience were Negro farmers. From these "essays" they learned the latest and best methods of work. This knowledge they carried home and made use of on their own farms. Their neighbors copied from them; and like the circle formed when a stone is thrown into the water, the knowledge of all sorts of practical things continues to spread. Then, too, every graduate is the center of a circle of information and help for those of his race who have not had his opportunities. This is what one man has done for his country, one little black boy who slept under a Richmond sidewalk, and began his education on a capital of fifty cents and a determination to do his level best.

AUGUSTUS SAINT-GAUDENS

GREATEST AMERICAN SCULPTOR

1848–1907

1887, Lincoln's statue unveiled in Chicago

ONE September day in 1848 there landed in Boston town a young Frenchman, his pretty Irish wife, and their baby son. The man was a maker of fine shoes. He had served his apprenticeship in the slow, old-fashioned way, and now he was ready to show the New Yorkers that their lasts were entirely wrong, and that whether the shoes which he made for them were comfortable and fashionable or not, they were correct, and this was all that could be asked.

His son said years afterwards that the only time when shoes were properly made in that shop was once when the proprietor was away for some weeks. Nevertheless, it somehow came to pass that the wealthiest and best-known people in New York were customers. Maybe they cared less for the shoes than for the pleasure of arguing with the positive little shoemaker, who talked "with a wonderfully complex mixture of fierce French accent and Irish brogue," and was ready to leave his work for an argument at any moment. One of these customers noticed in a little pause between arguments a small boy in a corner making pen-and-ink sketches of the shoemakers as they worked, and pleaded that the boy should be allowed to become an artist, as he wished.

This small boy said in later years that he was a boy of streets and sidewalks; and certainly he was more like a street Arab than an ideal genius. He helped stretch cords across the sidewalk to knock off men's hats in the dark. He lowered his mother's basket of sweet potatoes without her consent and cooked them in a cobblestone furnace in the street; and his "gang" fought with other gangs whenever they came together. He says that in school about fifteen of these boys were lined up every afternoon to receive their daily whipping. They formed a dire and dreadful plot to murder the teacher; but somehow he escaped the consequences of his misdeeds.

When Augustus Saint-Gaudens was thirteen, his father said one day: "My boy, you must go to work. What should you like to do?"

"I don't care," the boy replied, "if it is only something that will help me to be an artist."

Early in the nineteenth century a few American painters were successful enough to be known in Europe, but there were hardly any sculptors, and they made their homes in Italy as soon as the fates permitted. They could not easily do otherwise. There were neither teachers nor good statues in America. There were no bronze foundries and no good statuary marble. In 1853 there was just one equestrian statue in the United States. As the years passed a deeper interest was taken in sculpture. Artists began to return to America after studying abroad. Even then, however, although there were sculptors of ability in the land, they were

absorbed in their own work and did not care or were not prepared to teach. Cutting cameos was a step in the right direction, perhaps as long a step as could be taken on this side of the Atlantic; and to a cutter of stone cameos the boy was apprenticed. But the cutter had a bad temper, and after three years he discharged the boy. To be sure, he came half an hour later with an offer of more wages, but the apprentice refused to return. He never forgot his father's proud little smile as he listened to the son's speech of refusal.

To make cameos of stone was far more aristocratic employment than to make them of shell; and the young Augustus felt a little humiliated when he made an engagement to work for a cutter of the latter. Fortunately, the new master owned a lathe for cutting stone cameos which he was glad to have used; and so dignity was saved. Even better than this, he was interested in his apprentice's talent, and gave him extra time every day for modeling. Then, too, the young man studied at Cooper Institute, working every evening long after the class was over. "Some day I shall be a famous sculptor," he used to say to himself; and he was ready to work night and day to bring his dream to pass.

When he was nineteen his father bought him a steerage ticket to France and gave him a hundred dollars, saved from the son's wages; and before many days had passed the cameo-cutter was studying modeling in Paris with all his might. He was supporting himself by cutting cameos, but the mod-

eling was so much more interesting than the cutting that he gave the latter only time enough to keep himself from starving. Every little while he took a cheaper room, moving after dark so that no one should see how little he had to move.

When he first came he had applied promptly to the American Minister to make a formal application to the Beaux Arts for his entrance. After nine months of waiting — and working — a big envelope with the seal of the United States was handed to him. It contained his certificate of admission. This was more than a permission to enter an art school; it was a declaration of belief in his talent, and he worked with more enthusiasm than ever.

Then came the Franco-Prussian War. One regiment after another left Paris for the front. He could hardly help joining them; but letters from his parents came continually, begging him not to enlist, and he yielded to their entreaties. To a friend he wrote: "They are getting old, and love me. They have worked hard all their lives, are poor, and are still working. What would happen if they should lose me now? You can imagine what a miserable state of mind I am in."

But a happy day was coming. Saint-Gaudens had made a clay model for a statue of Hiawatha, "pondering, musing in the forest, on the welfare of his people." It was nearly done, but he shut the door of his studio and walked away gloomily. Here was a piece of work that he believed would bring him fame, and he had not the money to have it cast

in plaster. But the fairy godmother — or rather, godfather — appeared in the shape of a wealthy American. The Hiawatha was cast in plaster, cut in marble, and sold in America. "I suppose I danced with glee," wrote Saint-Gaudens. He returned to America for a while. "I am traveling in the steerage," he said, "but some day I'll be crossing the ocean in the cabin as a well-known artist."



DEACON SAMUEL CHAPIN

This monument, in memory of one of the founders of Springfield, Massachusetts, is one of Saint-Gaudens's most picturesque works. It is not intended as a portrait but as an ideal embodiment of the principles of the stalwart old Puritans of New England.

In 1875 Saint-Gaudens was in America, with a dismal little studio and such longing for Rome that, until the engineer of the building objected, he used to let water trickle into his bowl to imitate the sound of a favorite Roman fountain. There was another reason for his gloom. The father of a cer-

tain young lady now on her way to America had refused to consent to her marriage with the sculptor until he had at least one important commission; and no commission had come.

A statue of Admiral Farragut was to be erected in New York, but there was not much chance for a little known sculptor to be chosen as its maker. Saint-Gaudens did his best to get the commission. He made two models, a large drawing, and a bust; and he won the prize. After two years the statue, in plaster, was exhibited in Paris. One year later it was formally unveiled in New York City, and now stands in Madison Square.

There was no question that the maker of this statue was a great sculptor. The Admiral stands on deck, his feet wide apart, as they have to be to keep one's balance on shipboard. He is very much alive and very human. At the first glance you feel that it is a real person, not a figure which the sculptor has imagined as an ideal admiral. Before it was cast in bronze Saint-Gaudens wrote, "At times I think it's good, then indifferent, then bad"; but no one else doubted that it was good. Even the crowds about the statue, most of them people who knew nothing about art, felt its power and its meaning. "You have preached a small sermon on truth, honor, courage, and loyalty," wrote one of the best critics of the day to the artist. One midnight, soon after the unveiling, Saint-Gaudens, his wife, and a friend passed near the statue. There stood an old man with his hat off. "Why, that's father!" the

artist exclaimed. "Father, what are you doing here at this hour?" "Oh, you go about your business!" his father replied. "Have n't I a right to be here?" Everybody had praised the statue, but I fancy that this bit of appreciation pleased Saint-Gaudens more than all the rest. A few years after this the father died. He had always been very dear to his talented son; and that night the artist walked sobbing back and forth in his dimly lighted studio, telling his own little son all that his father had meant to him.

Saint-Gaudens was remarkably successful in his low-relief portrait medallions, a graceful, delicate, fascinating species of art. It is not easy, for while a statue is in the shape of nature, a low relief is not, and yet must appear to be. Saint-Gaudens did such fine work in this line that some people who had not seen his statues wondered whether he would be able to make them as strong as the medallions were exquisite.

Besides the Farragut, Saint-Gaudens's most familiar works are the statue of Sherman, the bas-relief memorial of Robert Gould Shaw, the statue of Lincoln, and the statue in the Rock Creek Cemetery in Washington.

In the Sherman statue Sherman is on horseback, pressing forward, while Victory, in the form of a young girl, is leading the way. It is so full of motion that one can hardly realize that it is not actually sweeping onward.

In the bronze medallion on Boston Common in

memory of Robert Shaw, who took command of a Negro regiment in the Civil War, the commander is on horseback, and with him are the marching Negroes, uniformed alike, carrying muskets all pointing the same way. It was not an easy problem to keep this from being stiff, to give no two prominent muskets exactly the same slant, and to keep the lower part of the bronze from being a mere wilderness of legs of horses and men; but the artist succeeded. This, too, is full of motion, but it is a silent, sturdy, determined motion, quite unlike the irresistible swiftness of the Sherman figure.

Entirely different from these is the statue in the Rock Creek Cemetery, which John Hay and many others have called Saint-Gaudens's masterpiece. It is a bronze figure of a woman with heavy drapery falling about her in loose folds. She sits on a block of granite against a granite wall. Her head rests upon her hand. The marvel of the statue is the face and its expression. The sculptor said, "My own name for it is 'The Peace of God.'" A few years later, when asked by a friend what he called the figure, he hesitated and then said, "I call it 'The Mystery of the Hereafter.'" "Then it is not happiness?" asked his friend. "No," he replied; "it is beyond pain and beyond joy."

Saint-Gaudens's statue of Lincoln appeals to everybody. The great statesman stands in front of his chair. One hand is behind him, the other grasps the lapel of his coat. His head is slightly bowed, and there is a solemn dignity and thoughtfulness in



Abraham Lincoln

Of this statue by Saint-Gaudens, Royal Cortissoz writes: "The Lincoln has always seemed to me one of the salient statues of the world, a portrait and a work of art of truly heroic mould. Simplicity is its predominating characteristic. Precisely in this attitude does one prefer to see Lincoln portrayed, with no hint of dramatic movement, with nothing of the orator, but with everything of the quiet, self-contained genius that was the same under all circumstances, in all crises. . . . It is as if Saint-Gaudens had divined Lincoln's very soul and had imaged him forth as men saw him under the stress of the war, and as he lives in the imagination of millions."

the attitude and in every line of the face. More than one sculptor has noted the lack of symmetry in Lincoln's measurements and has persisted in chiseling him as ill-proportioned and awkward. Saint-Gaudens realized that a man with a great thought cannot be awkward, whatever his measurements may be, and he has given us the real Lincoln.

Saint-Gaudens looked upon his pupils almost as his own children. He criticized their work so gently that one complained she could not tell whether he really meant it or not. When his son sent a drawing of himself for criticism, the father returned a playful note, saying: "I've forgotten how your ear is constructed, but if it's made like that, you have the only ear so placed in the world. You have tipped the top forward, instead of backward, as it exists with everybody but freaks. If your ear is so constructed, you need n't worry about studying to earn your living. You can earn that in a museum."

He was always conscientious in his praises, but generous. One day he came across a piece of work by a young sculptor which pleased him much. He called a cab on the instant, took the long ride to the door of the artist, and said, "I am Mr. Saint-Gaudens, and I've come to tell you what I think of the beautiful work you have done." There was no jealousy in him. When any one of his artist friends made a success, he was as proud of it as if it had been his own. He was too great to be jealous.

He liked people of all sorts, and they liked him. In the words of Weir Mitchell, "I think a sweeter

gentleman I never knew, nor one so magnanimous about his fellow-artists, nor any so capable of putting the high poetry of his imagination into marble."

JAMES JEROME HILL

BUILDER OF RAILROADS

1838–1916

1890, consolidation of the St. Paul, Minneapolis, and Manitoba Railroad with the Great Northern

James Jerome Hill was famous as a builder of roads, but the first one that he built brought him neither fame nor fortune. His father said, "If you will make a road from the farm to the village, I will give you a two-year-old colt." With the help of the other boys the hardy little fellow made the road. It was a mile long, and wherever there was a swamp he had to lay down logs, and then put smaller logs across them to form a "corduroy" road. When the work was done the colt was two and a half years old. The boy did not fare so well as he deserved, for his father had a creditor and the creditor wanted a colt, and poor little "Jim" was left crying in the vacant stall.

The Hill family removed to Rockwood, Ontario, and the boy was sent to the Rockwood Academy. He had attended a good district school from the time that he was five years old, and now for four years he was under the influence of the strong, wise, and inspiring man who was principal of the Academy. On the death of Mr. Hill the family made their home in Guelph. School had to be given up, but not study, and this was carefully guided by his

teacher and friend. The grateful boy never forgot this kindness, and in writing to this teacher thirty years later, he began the letter, "My dear old Master."

On leaving school he had found work in a store, and he felt rich, indeed, when he handed his first month's wages to his mother. He was faithful, and after one year his salary was trebled. He was not exactly a millionaire even then, for he had received at first only one dollar a week; but with sewing and washing and gardening, and three dollars a week as a steady income, the little family counted themselves well-to-do.

As the months passed, the boy became restless. He was probably not planning, even in his dreams, to build railroads, but he did feel that he might be doing something better than selling nails and calicoes in a village store. His mother believed in her boy and thought he ought to have a better chance in life; and so, quite in the story-book fashion, he started off one morning with twenty dollars in his pocket and a bundle swung over his shoulder on a stick.

Before many days had passed he was in Buffalo, with a dollar-a-day job. He had doubled his village salary, and he sent the twenty dollars back to his mother. Everybody was going to California in those days, and he went too — as far as Davenport, Iowa; thence to St. Paul, Minnesota. At the office of the steamboat company he asked for work. In less than two minutes he was hired. "If you

have n't sense enough to use figures, you are surely strong enough to hustle," said the man at the desk, looking at his sturdy figure.

In 1856 Minnesota built her first railroad. It was ten miles long; it had one engine and about a dozen open freight-cars. These were not especially well filled, because it was quite as easy to float logs down the river as to carry them to the railroad and load them into freight-cars; and the route did not pay. A new company bought it out, gave it the ambitious name of "St. Paul and Pacific," and extended it to connect with a line of steamers running north down the Red River to Winnipeg. James Hill was also a connecting link between road and river, for he had for some time been interested in the steamship line, and he now became the St. Paul agent of the railroad.

This was not a very magnificent position, for the road was not a success, and it owed a large amount of money; more than it could ever pay, said the wise folk who took the trouble to give it a thought. There was one man, however, who believed in the shabby little railway, and that was James Hill. He had been over the country between St. Paul and Winnipeg in both summer and winter, and he knew it thoroughly. He knew that it was fertile land and that it would raise wheat. But there must be settlers to plant the wheat, and there must be a railroad to carry the crop to market.

He succeeded in persuading several men of means and enterprise that the road was worth saving, pro-

vided the bondholders, chiefly Dutchmen, would sell out at a low price. The Dutchmen sent representatives over from Holland, and when they had learned the condition of the property, they agreed to sell the bonds at less than half their face value. The four men formed a company, and Hill became general manager — which meant that he had the responsibility of making the road pay.

He had some very definite ideas of how this should be done. If he could fill the country with prosperous, contented settlers and the railroad served them well, its fortune would be made. He set to work to improve the miles of the decrepit old road, and to extend them; and this one man was the inspiration of the whole work. The summers were hot and the winters were cold; but somehow, either by dog-sled, on horseback, or on foot, he managed to be here, there, and everywhere, especially where he was not expected. It was said that he knew every spike that went into the road. At an average rate of three and one fourth miles for every working day, the railroad was pushed on to the westward, through Minnesota, Dakota, Montana, Idaho, Washington, to Puget Sound. Never had a railroad been built so rapidly before.

To drive on the building of six thousand miles of railroad would generally be enough to occupy one man, but Mr. Hill was at the same time attending to the other side of the business, he was filling the country with people. To genuine settlers he made prices of land low and terms of payment easy.

Moreover, he did not leave them to struggle on alone after they had bought the land, for he imported farm horses and cattle to make sure that they had the best stock. Seeds and farm implements were provided at much less than market prices. Hundreds of thousands of comfortable homes were established in the "Jim Hill country." Mr. Hill himself set up a model farm near St. Paul, and there he ran an "experimental station," giving the farmers the benefit of his experiments.

There was no question that hundreds of millions of bushels of grain could be raised in Minnesota alone; but it would be of small value to either the settlers or the world unless it could be carried away from the grain fields and distributed where it was needed. Moreover, it must be carried cheaply; and here was one of the problems that Mr. Hill had been solving. This general manager "hated like poison an empty box-car on one of his trains." Hauling an "empty" was the same thing as carrying freight for nothing, and was a loss to the railroad. The people on the Pacific Coast were glad to get the grain of the East, but they were comparatively few in number, and had not much to return. The result was that freight-cars from Minnesota to the Pacific Northwest were loaded; but from the Northwest back to Minnesota they were often empty; and every empty car made freight more expensive.

Mr. Hill had not built the Great Northern without foreseeing that this would happen, and finding a remedy. In the Northwest was the best lumber in



THRESHING WHEAT ON ONE OF THE GREAT FARMS NEAR THE LINE OF THE GREAT NORTHERN RAILROAD

Many of these farms are from ten to seventy square miles in extent; and it is not infrequent to see a row of twenty or more plows, harrows, seeders, reapers or threshers at work at one time.

the world. There was no market for it because the other railroads had charged ninety cents to carry one hundred pounds East. He called together the principal lumbermen and asked, "How much can you afford to pay for freight on lumber?"

"Sixty-five cents a hundred," they replied.

"No," objected this original manager; "you could send a little at that rate, but you could not move any large amount if you paid more than fifty cents a hundred." This was something new, and the lumbermen began to open their eyes. Mr. Hill continued, "I will give you a rate of forty cents on fir and fifty cents on cedar."

The result of this was that there were long lines of cars loaded with lumber, so many, indeed, that trade actually began to swing the other way, and soon the "empties" were not going east, but west; that is, they would have been if the general manager had not been looking out for this very state of things and providing a remedy before it came to pass. He had been sending men to Japan and China and India, and he planned a great business in carrying wheat to Asia and bringing back Asiatic products. He had built two huge ships to ply between our Pacific Coast and the Orient; but laws forbidding railroads to make competitive rates or to own steamship lines made it impossible to carry out his schemes for building up this foreign trade.

Mr. Hill maintained strict discipline, but he never tried to put himself on a pedestal away from his men. King Albert of Belgium was his friend,

and as his guest had been over the Great Northern Railway. In later years, when some one spoke of the King's friendliness with his subjects, he said he had learned that from Mr. Hill's manner toward his men.

On Mr. Hill's seventy-fifth birthday, the Veteran Employees' Association held a celebration; and the older ones among the employees swapped jokes and stories with him as freely as if they were boys on a fishing trip. In response to an address he said, "It has not been the easiest thing in the world to play first violin in the Great Northern band . . . but somebody must lead the band, or there won't be harmony." Three months after his death this same Association wrote of him, "While we respected and admired him, first and before all, and every year more and more, we loved him."

And yet this man never curried favor with his employees or any one else; but he was never intentionally unjust, and when he was sure that he was in the right, no power could move him. A conductor on the railroad was once discharged for breaking rules. He had a strong political "pull," and soon one United States Senator and two judges asked that he be put back into his position. Mr. Hill replied: "We are charged with the responsibility for lives and property committed to our care. The responsibility is a heavy one, and we cannot discharge it by retaining undesirable trainmen in our employ. I am surprised that these judges should so far lower themselves as to make their

request. They certainly should know better.... We have difficulty enough in securing good men, and this difficulty would be greatly increased if we paid any attention to such requests, even from the Bench."

As the world's greatest expert in transportation Mr. Hill spoke in 1912 on that subject, and put his finger on the weak spot in the transportation systems. When traffic is blocked, he said, and the railroad yards are filled with cars that cannot be moved, the railroad is losing money, business men are losing trade, and the workers are losing employment. Transportation must move freely and easily; but how? People talk of a car shortage, when they mean slowness of movement at the terminals; that is, time lost in getting into or out of or through terminal points because there is not room enough to handle the cars. More cars would only make matters worse. "If you increase the size of a bottle without enlarging its neck, more time and work are required to fill and empty it," said this keen-eyed man. "What is needed is not more cars, but larger terminals."

Among the many subjects in which Mr. Hill was interested was one of the questions that are pressing upon us to-day. He saw, as students had seen before him, that the number of inhabitants in the world was increasing much more rapidly than the amount of food. These students had dolefully predicted that the time would surely come when vast numbers of people must die of starvation.

Mr. Hill regarded the matter quite as seriously as they; but he had a remedy, and this remedy was conservation; which every one talks about now, but which few even thought about then. The ground is all that we have to depend upon, he said, and therefore we must plough deeply, fertilize, practice rotation of crops; in short, the quantity of food which an acre produces must be made to increase as fast as the population. Then, too, we must take care of the iron, coal, oil, etc., of the earth, for there is no more to come. We must use lumber wisely and carefully, because it takes many years for a tree to grow.

This address went everywhere. President Roosevelt called the governors of the States to meet at the White House to consider how the natural resources of the land could best be conserved and to listen to Mr. Hill. This was the beginning of the National Conservation Commission. In his later speeches Mr. Hill carried his ideas farther. He showed that during the nine years before that time, State expenses had increased 201 per cent, while State wealth had increased by only 65 per cent. "You cannot eat your cake and have it too," he said. Public money spent carelessly and uselessly throws a heavy burden upon labor and prevents a real national progress.

In giving up the presidency of the Great Northern he had said, "Most men who have really lived have had, in some shape, their great adventure. This railway is mine." But his name became as closely

associated with conservation as with railroads. He was asked to contribute a limerick in aid of some charity, and this is what he sent:

"There was a young farm in the West,
So much overworked and hard-pressed
That it wearily said:
'I'll just take to my bed
And drop through to China to rest.'

"But alas! when the roots of the trees
Caught the eye of the frugal Chinese,
They proceeded to pounce,
And to plant every ounce
Of that Farm to Potatoes and Peas."

JOHN MUIR

THE MAN WHO LOVED TREES AND MOUNTAINS

1838–1914

1890, instrumental in establishment of Yosemite National Park

"BAIRNS," said a Scotch father to his two boys, "you needna learn your lessons the nicht, for we're gan to America the morn!"

These boys, John Muir and his brother David, went to school in the old-fashioned way. Every day they had to learn three lessons in Latin, three in French, and three in English, besides spelling, history, arithmetic, and geography; and for every mistake the taws, or leather strap, was promptly applied. If they had dared to say they did not understand the lesson or that it was not interesting, the teacher would have whipped them harder than ever to bring them to their senses. It was to be learned, and that was all there was to the matter.

But now they were going to live in the wilderness far from schoolhouses, in the land where gold was found in the earth and sugar in the trees. It is no wonder that they were delighted. Little they cared how the old scow of a sailing vessel tumbled about on the six-weeks voyage; they were too happy to be seasick.

Then came years of hard work on the unbroken soil of Wisconsin. The twelve-year-old boy had to hold the plough and was required to make as straight

furrows as a man. He soon had to split rails, make hay, and dig wells. From four in the morning until nine at night the work went on. Even when he dropped in the field from sickness, he was not allowed to stop. No one was pampered in that family; for instance, wood was a burden in this country of forests, but to cut it took time, and in the whole house only one tiny stove was allowed. The stern discipline of Scotland was kept up, and for every act of disobedience or forgetfulness a thrashing was waiting.

In spite of the hardships the boys managed to find a good deal of pleasure. They were allowed only two holidays in the whole year, the Fourth of July and New Year's Day; but they loved the woods, the birds, and the flowers; they petted the oxen and horses and cat and dog; they learned that the animals loved and feared and suffered just as people do, that they were true to their friends, and were well worthy of faithful affection in return; they learned to swim and dive and climb, and they grew strong and hearty. John felt very proud of the fact that he could keep ahead of the hired men in most of the farm work.

When John Muir was fifteen or sixteen he began to be hungry for books. His father was willing that he should study, provided he did the same amount of work as usual, and when the boy begged for an advanced arithmetic one was bought for him. In the half-hour at noon he contrived to finish the book in one summer. Then he took up algebra, geom-

etry, and trigonometry. He borrowed books of the neighbors; but the household rule was to go to bed immediately after evening prayers, and the book-hungry boy could rarely snatch ten minutes for reading. "If you *will* read," said his father impatiently, "get up in the morning and read. You may get up in the morning as early as you like." He never dreamed that his son would be up at one o'clock, reading or working on some machine of his own invention; but he had given his word and he would not break it. And what did the boy not invent? There were water-wheels, a clock that would tell the day of the week and the month, would start fires and light lamps, besides connecting with his bed in such a way as to set him on his feet at any desired time. There was a thermometer, a barometer, a contrivance that would feed the horses at any hour, etc.

He thought that if he could get into a shop he might learn how to become an inventor, and make money enough to go to school. "Take your machines to the State Fair," advised an admiring neighbor, "and every shop in the country will be open to you."

So it was that John Muir made his start in the world. His capital was about fifteen dollars and his clocks, and a thermometer made of an old wagon rod. He had feared that perhaps no one would care to look at things made of wood, and he was genuinely surprised when at the fair he was respectfully told to choose whatever place in the Fine Arts Hall

suited him best, and a carpenter should make him a shelf. He won a prize of fifteen dollars and a diploma.

For a while he worked in a shop, but it did not give him the help that he had hoped for. He longed for the university and often wandered about its grounds, thinking that the students must be the happiest young fellows in the world, and wishing earnestly that he might join them. At length he screwed up his courage and went to the president. "I want to enter college," he said timidly, "but I have been to school only two months since I was eleven years old."

The president admitted him to the preparatory department, and a few weeks later he entered the freshman class. Four years he spent in study, working summers at farming to earn the money for tuition and food. The tuition he paid in full, but his food he sometimes cut down to fifty cents a week. One winter he taught a district school. It was part of his work to start the schoolhouse fire at eight every morning. This was easy enough — for one who knew how. He put a little powdered chlorate of potash and sugar on the stove-hearth near some shavings, then he made a little addition to his wooden clock, so that at precisely eight it let a drop of sulphuric acid fall upon the mixture. Not one morning did it fail him, and in the coldest days the schoolhouse was warm before the children arrived. "You won't do for a teacher," declared the farmer with whom he was boarding, "you are in league with the devil."

He kept up his inventing while he was at college, and many years after he had left, the janitor used to show people his room and tell long stories of the wonders that had been produced therein. He did not take any regular course, but selected what he thought would be of most use to him; chemistry, physics, mathematics, botany, geology, and a little Latin and Greek. Then, as he said, he "wandered away on a glorious botanical and geological excursion . . . leaving the Wisconsin University for the University of the Wilderness."

Whether this wilderness was north or south made no difference to him. He roamed about the Great Lakes, then turned toward Florida. He went on foot, a journey of a thousand miles. Even if there had been railroads going his way, they would have been of little use to him; he wanted to see things, not to be whizzed past them. Just where he was going, he knew not, and he cared little, for was not the whole wide earth his playground and his study? "I always know where I am, and that I am safe," he wrote later. When he was sleepy he lay down wherever he happened to be. If he happened to be in the right place this method of sleeping was a delight; but when he tried sleeping on swampy ground in Florida the result was a tropical fever. This prevented him from going to South America and turned his steps toward California.

Now he was indeed in bliss. He explored mountains and cañons; he studied the *Sequoia gigantea*, or "Big Trees"; he traced the paths of ancient glaciers

and found their courses clearer than those of the city streets. "Tracing the ways of glaciers . . . is glorious work," he declared. He rejoiced in everything, "the blessed storms and calms," the sunshine and the flowers, the frosty mornings, the stars and also the starless nights, the clouds, the "solemn gazing moon," the singing of the birds, the music of trees and waterfalls and avalanches.

Once he took a ride on an avalanche. When it started and caught him three thousand feet up on the mountain-side, he threw himself on his back and stretched out his arms. This kept him from sinking in, and he rode down in fine shape, covering in one minute the distance that it had taken him a whole day to climb. He crept to the top of a pine-tree in a tempest to see how a tree feels when it is swayed back and forth by a storm wind. An earthquake was to him only "kind Mother Earth trotting us on her knee"; and although the Indians grunted "No good! No good!" and even the birds fled in alarm from the shaking trees, he ran out of his cabin crying, "A noble earthquake! A noble earthquake!" Once he slipped behind the Yosemite Fall to see the moon through the water, and was in fairyland until the wind swayed the fall toward the cliff and the masses of water fell upon him like cobblestones. In a forest of the Sierras he found himself on one side of a log with a cinnamon bear on the other side. They stood gazing straight into each other's eyes. At last the bear's eyes fell, and he shambled away. "That was the time you should have had a gun,



SEQUOIAS IN MARIPOSA GROVE, SOUTHERN CALIFORNIA

John Muir says, "A diameter of twenty feet and a height of 275 is perhaps about the average for anything like mature and favorably situated trees. Specimens twenty-five feet in diameter are not rare, and a good many approach a height of three hundred feet. Occasionally one meets a specimen thirty feet in diameter, and rarely one that is larger."

John," remarked a friend to whom he told the story. "What for?" asked Muir quietly. "The carrying of a gun means a heart for slaughter. I don't kill things."

Muir describes objects in nature as if each one was his special friend. To him waterfalls differ as much as persons. One fall is a "staid, orderly, graceful, easy-going fall, proper and exact in every movement and gesture"; another "plunges over the brink of the precipice as if glad to escape into the open air." Trees are as individual as cataracts; the sugar-pine is "a remarkably proper tree in youth — a strict follower of coniferous fashions." The redwood branches "become excited" if any accident happens to the crown of the tree, and try their best to repair the damage.

Muir took three trips to Alaska, and here he tramped up mountains and over glaciers to his heart's content. He sat up nights to listen to the roaring of the crunching ice; he studied the flowers, talking to them softly in the broad Scotch of his childhood: "Ah, my blue-eyed darlin'! Little did I think to see you here: How did you stray away from Shasta?" He talked with the Indians about stars and eclipses and glaciers. They eagerly adopted him as a member of their tribe, gave him an Indian name, and promised him as many wives as he chose if he would only stay with them as their chief. From those three visits he gave to his countrymen not only a revelation of the marvels of Alaska, but one of the best dog stories in the world, the tale of

"Stickeen," the devoted little dog who adopted Muir as his master and shared with him the worst perils of the glaciers.

John Burroughs, too, went on one of the Arctic expeditions. Early one morning he called to his friend, who was sleeping between decks:

"John Muir, you should have been up here twenty minutes ago, enjoying this wonderful sunrise."

"John Burroughs," Muir called back, "you should have been up here twenty years ago instead of being asleep down there in your cabin by the Hudson."

Muir wandered — where did he not wander? The wonderful petrified forests of Arizona were his discovery. He went to Africa, India, Siberia, Australia, South America, New Zealand. "Going to the mountains is going home," he said, and with a pocket-knife, a bag of bread, and a little tea he would set out for a stay of many weeks among them. "I love to be up among the glaciers and mountains," he declared joyfully, "up where God is making the world."

Muir was not a mere nature-loving tramp; he was a valuable citizen, constantly adding to the knowledge of his countrymen about their own land. He worked hard with pen and voice to save the Yosemite and create a system of National Parks. "Everybody needs beauty as well as bread," he wrote. He aroused people to save what remained of the Big Trees. "Through all the eventful centuries since

Christ's time, and long before that," he pleaded, "God has cared for these trees, saved them from drought, disease, avalanches, and leveling tempests and floods; but He cannot save them from foolish men."

He pleaded for the Hetch-Hetchy Valley as if for the life of his own child, but he pleaded in vain. Colleges gave him their degrees and begged him to accept professorships; but to save the Hetch-Hetchy would have been more to him than all their honors. The Muir Woods near San Francisco and the Muir Glacier in Alaska, and, more than these, the love of nature which he awoke in the hearts of thousands, will preserve his name.

THEODORE THOMAS

THE MAN WHO TAUGHT US TO LOVE MUSIC

1835–1905

1890, Chicago Symphony Orchestra organized

When a boy of two years asks for a violin he is quite likely to want to "ride a cock-horse" with it or to break it open to see what is inside; but when the two-year-old Theodore Thomas begged his father for a violin it was because in his baby mind he realized that from this came the music which even then he loved. He meant to bring out that music, and when his father gave him an old violin he seated himself on the front steps and scraped away on the instrument with all his might, trying to "make it sing" as his father had done.

It was not long before he could make it sing, for his father soon began to give him lessons in earnest. When he was seven he could play any music that was put before him; and if he could help it he would not do anything but play. School was an interruption, and whenever he dared he sat writing music instead of studying his lessons.

"If Theodore continues as he has begun he will be a great musician one of these days," said his father; and it seems never to have occurred to either father or mother that the child ought to be taught anything but music. Of course he was displayed as a prodigy. Indeed, he said long after-

wards that he could not remember when he was not playing in public and earning money to help support the family.

When he was ten years old the Thomas family came to America. Then followed fifteen years of the queerest kind of musical education that a boy ever had. He played for dancing at parties; once he played in a saloon and passed round his hat afterwards; he was a member of a small orchestra; he played the horn in a marine band on shipboard for a year. He was left to do much as he liked, and he was full of pranks. One story is told of his being "treed" by an indignant policeman; but while the policeman scolded there came from the top of the tree such a merry tune that he stopped his lecture to listen. "It's only that Thomas boy," he said, and went away grinning. Once the musician started off with his violin, some tickets and posters, a horse, and a big pistol for the robbers for whose attacks he was boyishly hoping, and made a Southern tour. He would ride on till he came to some place that pleased him; then, when his money was spent, he would give a concert to pay his bills.

It certainly was a queer musical education, but it *was* an education, for with all his pranks he was always in earnest with his music. Even when he played for dancing he used to imagine that he was practicing, and he played every note as carefully as if he was performing before the most critical audience. He kept his thoughts clean and spotless. "I avoid vulgar talk and the reading of trashy

books," he once said. "Otherwise, when I come before the public and interpret master-works, and my soul should be inspired with noble and impressive emotions, these evil thoughts run around in my head like squirrels and spoil it all. A musician must keep his heart pure and his mind clean." Of course he improved, and of course he succeeded. When he was twenty-four he was called "America's most accomplished violinist."

When a man is fully prepared for an opportunity the opportunity is almost sure to come. Theodore Thomas's opportunity came one evening in 1860 when he had just settled himself into an easy-chair for a rest. The doorbell rang. "Our conductor is ill," said a messenger from the opera house two blocks away, "and the audience is waiting. Will you come and conduct the opera?" He had never conducted an opera and he was not familiar with the one listed for that evening, but he replied, "I will." He got himself into his dress suit, hurried to the Academy of Music, and succeeded. This was the beginning of his conducting. Dwight's *Journal of Music* said of him, "He directs the performances of venerable, spectacled, bald-headed 'cellists and trombonists old enough to be his grandfathers."

But Theodore Thomas was not merely "standing around" waiting to take whatever musical position might be offered him; he meant to devote his life to one thing, and that was to interest the American people in really good music. He lived in New York, and he hoped that he could teach the

people of that city to enjoy and appreciate music so sincerely that men and women of wealth would endow a permanent orchestra. He would be its conductor, and would make its work as perfect as any in the world.

He never forgot that his audience must be educated into enjoyment, and in 1866 he began by "Summer-Night Concerts." These were given in cool, airy halls, where potted palms and evergreens and perhaps a fountain made the place seem almost like a garden. The programs were not mere haphazard collections of musical pieces; they were chosen with much thought and were carefully arranged. The first part consisted of short, light numbers that would interest people and amuse them, but not serious enough for the wrath of the really musical part of the audience to be aroused by the inevitable coming in of the tardy folk. After an intermission came the second part, never heavy, but of deeper and more classic character. After a second intermission there were marches, waltzes, and a richly colored overture that would arouse the audience and send them away with strains of melody haunting their memories. He would never play trash, but he realized that the people in general were not educated in music and that they were rather afraid of the words "symphony" and "classical." His method was to make his programs just a little in advance of the general taste, but not to weigh them down and so alarm his audience. Whatever was to be played, whether

symphony or waltz, he always studied before rehearsal as if he had never seen it before.

This was all most excellent for the people, and the conductor had the great pleasure of seeing each year that his audiences liked better music than they had cared for before; but still his life was hard and wearing. He was the one person responsible not only for the quality of the music, but for the salaries of the musicians. If concerts failed, there was no guarantee fund to fall back upon. Theodore Thomas must pay the men of his orchestra or they must go unpaid. He did his best to pay by doing what he called "going on the Highway," that is, by making every year a concert round of some thirty of the principal American cities; but he could not altogether avoid debt.

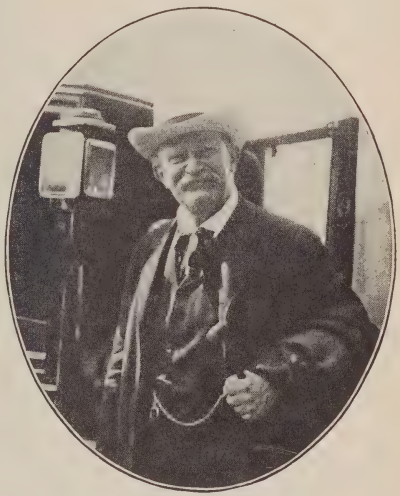
In the fall of 1871 Thomas and his orchestra were drawing near to Chicago when word reached them that the city was on fire. The opera house was already gone, and there was not even a place where they could spend the night. According to his contract Thomas was not obliged to pay salaries if fire or flood prevented giving concerts; but instead of taking advantage of this, he assumed the whole debt for salaries and expenses. In the Centennial year of 1876 he was asked to direct the music of the opening ceremonies at the Exposition and also to produce a series of summer-night concerts. These concerts would pay the debts, he believed; but it proved that visitors to the Exposition were too tired to go out in the evening. The concerts failed, and

the sheriff seized the conductor's only property, his valuable musical library. A good friend, however, bought it, left it in his care, and later presented it to Mrs. Thomas, begging her, if she should lend her husband any one of the books, to make sure that he took good care of it. There seemed so little hope of Thomas's ever being able to pay the debts which he had assumed that he was urged to become a bankrupt; but he refused, and in time they were all paid.

Thomas was one of the most kindly of men, but when reproof was deserved, he could be exceedingly severe. For several years he was at the head of the Cincinnati College of Music. One day some of the sopranos were inattentive, and he reproved them rather curtly. "He treats us as if we were members of his orchestra!" one singer exclaimed in wrath. Thomas said nothing then, but as he passed her in going out he said, "Madame, you will have to sing a great deal better than you do now before I shall treat you as I treat the members of my orchestra."

In circumstances that would have embarrassed most leaders he was never at a loss what to do. Once, when he was to play in Chicago on the eve of a presidential election, he was asked to end the concert with the "Star-Spangled Banner." The program had already been printed. It ended with quiet, gentle music; and how could he keep the people in their seats and make a transition from this to a patriotic song? His wife has described how he managed it: "As the last strains of the Massenet Suite were still vibrating on the strings,

the drums began a double roll so softly that it was barely audible. Louder, louder, and still louder it rose, till every heart began to beat wildly with excitement, wondering what was coming next. At last the moment of climax was reached, and then Thomas turned toward the audience, motioned to them to rise and sing, and with the full power of the orchestra, the great organ, the chorus, and the five thousand people of the audience, all joining together in one stupendous maelstrom of sound, the 'Star-Spangled Banner' was given such a performance as is not often heard. Many people were in tears before it was over, and when Thomas held aloft both hands to sustain through the full measure its final glorious chord, the singing was merged in a great shout — cheer on cheer echoing through the hall."



A Snapshot Portrait of Mr. Thomas

This was taken by a schoolboy at the Cincinnati Festival of 1894, and has become one of the most widely known pictures of the celebrated conductor.

Throughout the years the great wish of the conductor had been to have a permanent orchestra, and without his knowledge a plan was being quietly

formed to bring this to pass in Chicago. In 1890 fifty of that city's prominent citizens had agreed to form a guarantee fund for an orchestra if Thomas would become its director. The contract required the director to be responsible for "the highest standard of artistic excellence in all performances," and Thomas was delighted. "All my life I have been told that my standard was too high. . . . But now I am not only to be given every facility to



PERISTYLE AT THE WORLD'S COLUMBIAN EXPOSITION, CHICAGO, 1893

Symphony Hall is shown at the left. Mr. Thomas as musical director at the Exposition conducted a series of 125 concerts, whose programs demonstrated to the world the musical progress of America, and also gave Americans an opportunity of hearing all the best works of the most famous European composers.

create the highest standard, but am even told that I shall be held responsible for keeping it so! I have to shake myself to realize it."

At the end of the year there was a deficit, as might have been expected in a new undertaking, and Thomas was delighted to find that this was taken as a matter of course. But as year after year passed, there was still a deficit. The director believed that no orchestra could be permanent and successful without a building of its own. He felt sure that the people of Chicago would provide that building if the matter was brought before them forcibly; and therefore he announced that he should resign and go elsewhere if a building fund was not raised within six months. The trustees explained to the public the advantages and necessity of a smaller hall. Then a subscription was taken. Theodore Thomas's work of teaching people to love music had been well done, for on the list were the names of millionaires, clerks, and scrubwomen, the educated and the uneducated, but all lovers of music.

The hall was built, following just as far as possible the ideas of the director, and was as nearly perfect as a hall could be. There was a superb opening concert, ending with Handel's glorious "Hallelujah Chorus," and after this there was a happy meeting of old friends at the Thomas home, come to congratulate the Master. And congratulations were due to him. When hardly more than a boy he had chosen a lofty work, that of revealing to hundreds of thousands of busy Americans the pleasure and restfulness and inspiration of music. He had refused to lower his standards. Without thought of himself or his own gain he had given to the world

his noblest and his best. As George William Curtis says of him: "He has made the conductor's baton an imperial scepter, with which he rules not only an orchestra, but an ever-widening realm of musical taste and cultivation. In his hand it has been an enchanted wand, which has transformed our musical ignorance and crudity into ample knowledge and generous appreciation."

THOMAS ALVA EDISON[1]

INVENTOR

1847–1931

1893, the incandescent light first used on a large scale (at the World's Columbian Exposition)

ONCE upon a time there was a small boy who always stood at the foot of his class. One day he heard his teacher say that his brain was "addled," and there was no use in his coming to school. The little fellow was not too dull to know what that meant. He burst into tears and went home to tell his mother.

The mother was a very indignant woman, and she stood firmly by her little son. She declared that he had plenty of brains and she should teach him herself. She succeeded, and when he was only nine he had read or she had read to him such books as Hume's *History of England* and Gibbon's *Decline and Fall of the Roman Empire*, both works in many volumes and not especially easy reading, even for grown-ups.

He also read books on science, and he set up a chemical laboratory in the cellar. But both books and chemicals cost money, and he appealed to his mother to let him become a train-boy. He could have a run from Port Huron to Detroit, earn plenty of money for his experiments, read as many papers

[1] The material in this chapter is, by permission, based upon William H. Meadowcroft's *Boy's Life of Edison.*

and magazines as he chose, and have several hours every day in Detroit. He must have shown that he could be trusted or his mother would never have agreed to let a boy of twelve spend seven or eight hours a day alone in a city. As a matter of fact, however, he was in the best of company, for he spent most of the time in the public library reading.

There is a picture of "Al," as he was then called, at fourteen, with a bright, cheery face and the most delightful grin, as if he had just heard the funniest story in the world. He was a wide-awake business man as well as a merry boy, and when the war broke out he picked up an old printing-press, bought some type, and proceeded to publish a weekly paper. It was really of value, because the young editor could get the latest news by the railroad telegraph, and before long it had a circulation of four hundred.

By and by came the battle of Shiloh. Perhaps the boy did not know much about Shiloh, but he did know that if there were crowds before the bulletin boards in Detroit, there would be at least one thousand people on his route who would want the news. He bribed the telegraph operator at the station to telegraph the news ahead. Then he told the editor of the *Detroit Free Press* what he had done to make sure of trade and asked for credit. "I can pay for three hundred papers," he said, "but I want a thousand. Will you trust me?" He was trusted, and he sold every paper. Indeed, there were not nearly enough to go around.

One day "Al" saved a little child from being run over by a train, and the grateful father said, "I cannot reward you in money, but I can teach you to telegraph and get you a situation." "Al" engaged a friend to take part of the run; but even then, with his telegraphy, chemistry, and train work, he was a very busy boy. It was through chemistry that misfortune befell him, for a stick of phosphorus among his chemicals on the train took fire and set the car ablaze. The conductor put out the fire, and then he himself was ablaze — with wrath. He boxed the boy's ears, thereby making him deaf for life, and then dumped boy and chemicals and printing-press off at the next station. There was no more room for him on that train.

He decided to become a telegrapher. This boy of sixteen was never satisfied until he could do his work in the best and quickest way. He gave eighteen hours a day to practice, and he worked on penmanship until he was convinced that he had found the fastest style of writing. There are stories without end of his life as an operator. One is that when an ice-jam had broken the cable between Port Huron and Sarnia, he borrowed the steam whistle of a locomotive and made the long and short signals of the Morse code. After a while an operator on the Sarnia shore caught the idea, and communication was restored. Later, the manager of his office was put into a military prison — no one knew why — and Edison "telegraphed" to him by stretching his arm out of the window and

making long and short motions. Wherever he went and whatever he was given to do, he always invented some way to improve upon the usual methods.

In the course of his wanderings as an operator he asked for a position in Boston. He was engaged, but the other operators set him down as a greenhorn, and wickedly arranged to have him take a report from the fastest operator in New York. Edison went on serenely without the least trouble, writing out the matter in his clear handwriting, while the others gazed over his shoulder in amazement. When he thought the joke had gone far enough he opened the key and remarked to the man in New York, "Say, young man, change off and send with your other foot."

All this time he was experimenting in chemistry and electricity, and of course he sometimes met with accidents. One day he splashed himself with nitric acid, and could not appear on the streets for two weeks. He tipped over a carboy of sulphuric acid, which went through the floor to the room below and ate up the manager's carpet and desk. The next morning he was told that he might get his pay and leave; the company wanted operators, not experimenters.

When Edison was twenty-two he concluded to go to New York. He was always out of money because he spent it on experiments as fast as he got it, and he found himself in the city with only one dollar, and that a borrowed one. He got permission

to sleep in the battery room of the Gold Indicator Company. This was after the Civil War. It was not certain that the Government would be able to pay its debts, and therefore a gold dollar was worth more than a greenback. The price of greenbacks went up and down. People speculated in them. and this Gold Indicator Company had put indicators into the offices of three hundred brokers.

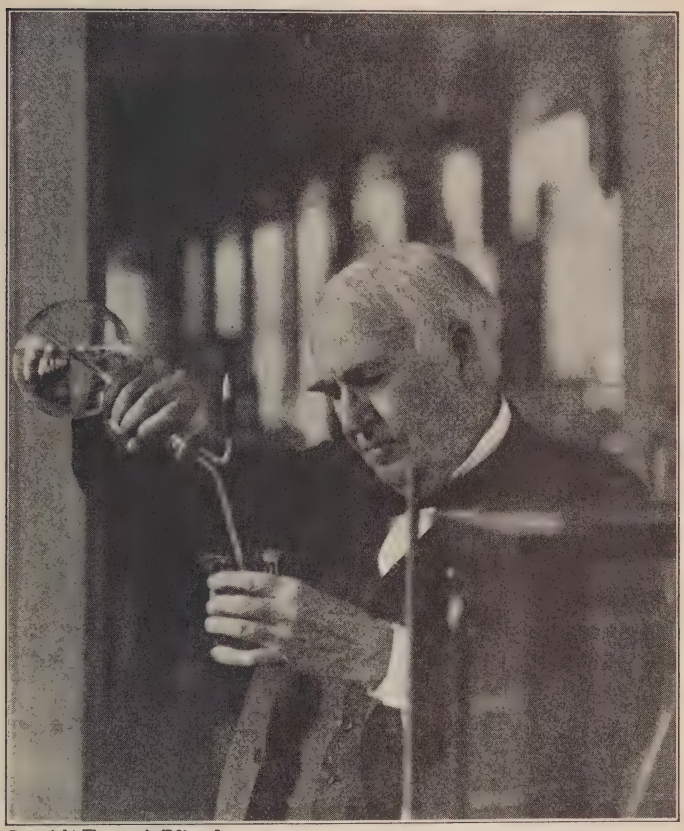
Edison was studying the various instruments when there was one big crash, and everything stopped, not only in this office, but also in every one of the three hundred. The manager was half wild, and when Edison said that he could fix the indicator, he cried, "Fix it! Fix it! and be quick!" In two hours it was in order. Then came an official interview. "I shall put you in charge of the whole plant," the manager said. "Your salary will be three hundred dollars a month." Edison was almost dazed, but he said to himself, "I will try and live up to that salary, if twenty hours a day of hard work will do it."

Edison soon invented a stock ticker that was a great improvement on anything then in use. The Gold and Stock Telegraph Company wished to buy it, and the president asked how much he thought he ought to have for it. The inventor really thought he had earned five thousand dollars, but he had not the audacity to say so, and he replied, "Suppose you make me an offer." "How would forty thousand dollars strike you?" the president asked. It struck him so by surprise that he almost

fainted. He carried to the bank the check for forty thousand dollars, the first check that he had ever received, and endorsed it after it had been made clear to him that this was the proper thing to do. He knew so little of banking that when the teller gravely and mischievously proceeded to hand him package after package of small bills, he put them into his various pockets and walked away. He had a use for that money, and he sat up all night watching it for fear it should be stolen from him.

He was not yet twenty-three, and he had forty thousand dollars which he had earned by the honest work of his own "addled" brain. He spent much of the money in opening shops to manufacture tickers. That brain was now at work on his old friend, the telegraph. Sending messages was even then so slow that a first-class operator who wrote rapidly could write them out as they were received. Edison's inventions made it possible to send four messages over the same wire, three thousand words a minute, and also printed them as fast as they came in.

The carbon telephone transmitter, the quadruplex, the electric light, the moving-picture camera, the electric storage battery, the phonograph, the waxed paper in which candies are wrapped — these are only a few of his most generally known inventions. "Won't you please name your chief inventions?" a visitor asked; and Edison named seven or eight, ending with, "Oh, I don't know, a



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EDISON IN HIS LABORATORY

whole lot of other things." He did not invent for the sake of inventing, but because he saw the need of something that would add to the comfort, convenience, safety, or pleasure of the people. It is no wonder that he was often called the most useful citizen of the world.

Edison had a laboratory at Orange, New Jersey. It contained a machine-shop, rooms for experimenters, a library of many thousand volumes, cabinets of minerals from all over the world, a stock-room in which were, as far as possible, specimens of every known substance that can be kept without spoiling. This means not only chemicals, but also fur, feathers, bones, shells, woods, roots, gums, cotton, silk, wax, cork, pitch, all kinds of metals — there was no end to the variety, for Edison aimed at having within reach of his hand every substance that he might chance to want.

But a million men might have all this collection and not produce one invention in a century; how did Edison do it? What was there in him that is not in the men who invent nothing, and see nothing to invent, but plod along in the same old way?

In the first place he had a strong imagination. He saw in his mind just what results he wanted to reach. In the second place, it never occurred to him that he could give up a quest, and he was never discouraged. The story is told that once, after several thousand experiments had failed to accomplish what was wanted, an assistant remarked that it was a shame to have worked all those weeks with no results. "No results!" Edison exclaimed. "Why, man, I have a lot of results! I know several thousand things that won't work."

Edison himself said that his methods were the same as those of Luther Burbank. Out of thousands of plants Burbank picked out perhaps only

one that showed promise of what he was after. The seeds of this one he used to develop the variety of which he was in search. So Edison, having a definite result in mind, chose from thousands of experiments the one that promised the result that he wanted. "But, after all, Mr. Edison," he was once asked, "is n't your success due to genius?" "Genius," said Edison, "is one per cent inspiration and ninety-nine per cent perspiration."

Edison never blundered along vaguely in the hope that some time he would happen to put the right things together; he worked intelligently and thoughtfully — and how he worked! To experiment sixty hours on a stretch was not unusual with him. He knew how to turn sharp corners, and rested by going from one invention to another, or from hard work to a bit of fun or a good story. He could take a table for a bed, a book or two for a pillow, fall asleep in half a minute, and in a quarter of an hour be ready for work again.

As to his working hours, he had none. He did not carry a watch and knew little about time; his day's labor was done when he obtained his results, and not before. Of course many people asked him to what he ascribed his success. His answer always was, "To never looking at the clock."

EDWIN AUSTIN ABBEY

ILLUSTRATOR AND PAINTER

1852–1911

1895–1902, painted "The Quest of the Holy Grail," a frieze in the Boston Public Library

EDWIN ABBEY'S father and mother had the life of their son nicely arranged in their own minds. They would give him a good education, he would become a doctor or minister or lawyer, he would continue to live in Philadelphia, and would become one of her most respected and honored citizens.

This was what they planned, but somehow the boy did not seem inclined to follow the plan. He went to school, of course. He did not stand at the foot of the class; but, alas, he was nowhere near the head. He read everything that came to hand, and he did not object to being educated, but he took no special interest in the process. There was just one thing in which he did take interest, and that was drawing. He would have liked to take lessons in drawing, but his father did not approve. If the son would not become a member of one of the three learned professions, he should at least become a substantial, self-supporting citizen, not a mere picture-making man. There was the printing trade. Often it led to something higher; his son should learn printing.

So it was that the boy was put into the printing

office of the *Public Ledger*, of Philadelphia. Perhaps there was a bargain between him and his father, for, although he learned to set type, he was allowed to have lessons in drawing for an hour three times a week, at the Pennsylvania Academy of Fine Arts.

The owner of the *Ledger* was George William Childs. He was a man who could see what was going on around him, and he soon noticed that the young man was not especially interested in type-setting. After a little talk he found out that the ambition of his apprentice was not to become an editor, but to draw pictures, and he examined some of young Abbey's sketches. They seemed to Mr. Childs full of promise, and a kindly note from him to the editor of *Harper's Weekly* sent a happy young man with a portfolio over to New York to the Art Department of the *Weekly*. He was engaged at a salary of seven dollars a week; not a very enormous sum, but many an artist of nineteen would have been glad to pay much more for the chance of being on this paper.

Abbey put his best work into whatever he undertook; but before long it was clear that his special delight was in picturing scenes of a century earlier, clumsy stage-coaches rolling up to change horses at quaint old taverns; ladies with bandboxes and many flounces; drivers with bell-crowned hats. The people of his pictures were often amusing, for he did like a touch of the humorous, but they were also lovable. It was all done with accuracy and

daintiness, and was altogether delightful. It is no wonder that his drawings soon began to appear in *Harper's Monthly* as well as in the *Weekly*.

This was a step forward; but it was a still longer one when the Harpers decided to bring out a *de luxe* edition of the poems of Herrick, and asked Abbey to illustrate them. To do this he was to spend six months in England and see for himself the stately castles, mossy sundials, fields of primroses, thatched cottages, shady lanes, and charming little villages.

Abbey and an artist friend took up their home in the Shakespeare country, in a rambling house some three hundred years old, and he set to work happily. He drew and drew; cavaliers in plumed hats and sweeping cloaks; tall and graceful maidens in high puffed sleeves, playing on the guitar or curtsying to some young gallant with wide ruff about his neck and buckles on his shoes. He drew cowherds playing for a prize on oaten pipes before the rustic maiden "Lalage." They are tremendously in earnest, and they have not the least idea that even the cows in the background are looking at them. The people of Abbey's pictures have no self-consciousness; they do not know that they are sitting for their portraits. They are always alive, and even if they are not doing anything the artist manages to make it clear that they are thinking of something in which we too are interested. The edition of Herrick came out in 1882, and was the first of Abbey's illustrated books.

Abbey spent in England, not six months, but two

years. He loved the old houses and the country lanes, the winding streets of the little villages, the distant glimpses of castles and cathedrals. America was dear to him, but England was the country of his dreams, the place where he could best do the work that he loved. He returned to America for a few months, then made his home in England.

He had great talent and he loved his work. Some one said of him that what he loved was not "drawing the money, but doing the drawing." Into everything that he did he put his best efforts. Many artists of his experience and ability would have drawn the less important illustrations from fancy; but Abbey was never satisfied unless he drew his figures from life and even his backgrounds directly from nature. After finishing one painting he discovered that the coat of arms on a lady's dress was not quite accurate. Probably there were not ten persons in the world who would have noticed this, but he painted the whole skirt over again. He took quite a long journey to see for himself some peculiar columns that he wanted to bring into a scene. He never undertook a picture without studying the period as carefully as any historian could have done. He made himself perfectly at home in the olden times, and what he meant to draw became so clear to his own mind that he could express it in a few lines. The result was that his pictures are never foggy, and they are always convincing. When we look at one we feel sure that the people of that day did dress and bow and stand

and smile exactly as he has made them do. He not only paints them, but he seems to feel and think with them. We forget that we are looking at a picture, and think of it rather as a glimpse into the life of bygone days.

Before 1885 Abbey was recognized as one of the foremost illustrators of the day in black and white. He was also using with great success both water-colors and pastel, and he had done some excellent work in oils. Possibly he would have been content to spend his time chiefly in illustrating, but the American girl whom he had married believed that he had even more ability than he had as yet shown, and she urged him to devote himself to oils. She was a wise woman, for in 1890 an oil painting of his was accepted by the Royal Academy and was hung "on the line."

That same year he was asked to decorate the frieze of one of the rooms in the Boston Public Library. He had bought a beautiful old country place, and now he built an addition to the house, a "royal studio," planned expressly for the Boston paintings. It was seventy-five feet long by forty wide, and twenty feet in height — space enough for a dozen painters. Here he kept chests of the old costumes in which he delighted, china, furniture, ancient armor, swords and spears, exquisite carvings, tapestries, anything and everything that he might wish to use in his paintings; and now he set to work to make his pictures.

The subject was left to him. He wanted some-



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Galahad the Deliverer

From the frieze "The Quest of the Holy Grail." This is the twelfth panel in the series of fifteen. It represents Galahad, surrounded by folk thankful for services already rendered by him, about to ride away upon his last great adventure in his quest for the Holy Grail. "The career of this knight," says one critic, "may be said to symbolize the experiences of mankind in the pursuit of the noblest ideals, the difficulties that beset the seeker, the temptations which he encounters, the results that he achieves."

thing with dignity and significance, something old and legendary; and in order to suit the lengths of paneling it must be not one scene, but a continued story. At length he settled upon the legend of the Holy Grail, the cup from which Jesus was said to have drunk at the Last Supper. According to the legend it was long treasured, but finally, as the world grew evil, it vanished from the eyes of men. To find it was a favorite quest of the heroes of romance; and at last Sir Galahad was successful.

No two versions of the story are just alike, and Abbey was free to take from all what would best suit his purpose, and to lay his scenes in almost any of the earlier centuries. He chose the twelfth century, and now began study in earnest. He read with the utmost care English, Norwegian, French, and German versions of the legend. He pored over accounts and pictures of ancient temples and palaces. He studied details of twelfth-century costumes. He went to France to sketch in the old churches. He went to Italy to draw landscapes and twelfth-century architecture. Long before he began to paint his mind was saturated with the story and its surroundings.

For his hero he takes the pure Galahad, who, after the death of his mother, is brought up by the nuns, far from the temptations of the court. In the first scene the infant Galahad, held by a holy maiden, stretches out his baby arms to the Grail, which he alone can see. In the second, Galahad, clothed in red, is kneeling before the altar in all-

night vigil before his search for the Grail begins. The next scene is in the great hall of King Arthur. Joseph of Arimathea leads Sir Galahad to the Round Table, to the seat in which no one impure in life or thought can sit and live, and declares that he only will achieve the adventure of the Grail. The other knights, forgetful that he who wins must be sinless, take a vow to go on the quest. Kneeling in the cathedral with Sir Galahad in their midst they receive the benediction of the bishop on their search. So the pictured story goes on to the time when Sir Galahad's soul is "too great in knowledge and power to abide crippled in his earthly body," and he is taken into heaven. A hand, coming down from above, withdraws the Grail from mankind, never again to be seen on earth.

This is one of the noblest if not *the* noblest specimen of mural decoration in America, and its artist had good right to be proud of it. Instead of that he looked upon it only as a step to something better; and when a friend congratulated him on his success, he replied simply, "Give me a little time, and I will do something worth while." For this work Abbey received fifteen thousand dollars, and he spent every dollar of that sum in costumes and models and research.

When the time came for the coronation of Edward VII, in 1901, Abbey was chosen to paint the scene. Then his troubles began. To be asked was a great honor, of course, but it was not a time of bliss for the painter. More than one hundred

distinguished persons must appear in paint, and every one must have sittings with him. The king and queen gave him no trouble, they were promptness itself and were not difficult to please; but as to the peers and peeresses — Abbey must have wished many a time that they were all knights of the Round Table and could be painted straight from the visions in his brain. These troublesome people paid not the least regard to their appointments; every man and woman of them expected to have a full-face portrait; and the ladies were wrathful if their long trains and jewels were not brought well to the front. It was a struggle, but Abbey was successful, and the painting was accepted as the official pictorial record of the great event, as "the most artistic, dignified, and accurate reproduction of the ceremony of investiture."

Abbey was always kind-hearted, lovable, and generous. Of course young artists often asked him to criticize their work, and no matter how discouraging it was he always contrived to find something pleasant to say about it. He was engaged to decorate the State Capitol at Harrisburg with scenes from early Pennsylvania history. He found that the space was too small, and he asked for room enough to enlarge his figures; thus planning to present to the State thirty thousand dollars' worth of his work. He gave generously of both money and talent and kindness, and he received generously in the admiration of the world of art and the love of all who knew him.

SAMUEL PIERPONT LANGLEY

INVENTOR OF THE FIRST HEAVIER-THAN-AIR FLYING MACHINE

1834–1906

1896, first flight of a heavier-than-air machine

It is not always easy for a boy to decide what he will do when he becomes a man, and it was no easier for Samuel Langley than for other boys. Maybe it was a little more difficult because he was interested in everything. His father made telescopes, and he had often watched through one of them the workmen laying the stones of Bunker Hill Monument. He had already made a small telescope for himself, perhaps he would like to make larger ones and study the stars. Then, too, he had talent for drawing, not enough to make him a great artist, but enough to serve him well if he cared to study architecture. There was civil engineering also; he thought he might like that.

Besides all this there were so many things that he wondered about, so many questions that he wanted to answer. He wondered how birds managed to fly, inasmuch as they were heavier than air. He wondered why white flowers were sweeter than scarlet ones, why insects on trees were green while those on the ground were brown. He wondered why plants grew faster in a hotbed. The answers to some of these questions he thought out for himself; others he found out later.

By the time that he had graduated from the high school he was sure that he wanted to know more of science. He decided to become an architect, for he believed that he could do good work in this line and also that it would give him opportunities for further scientific study. So an architect he became. He worked faithfully for seven years, and successfully. He made a good income which showed signs of increasing.

It is quite probable that his friends heartily disapproved of his next move, for he suddenly gave up architecture and began to make telescopes. He was only thirty years of age, but telescope-making had improved since his boyhood, and he was delighted to find that he could make much more powerful instruments than his father. He not only made them, but used them, and before long he was invited to become assistant in the Harvard Observatory.

He must have made a good amount of progress, for he was soon offered a position in the Naval Academy at Annapolis as Professor of Mathematics and Director of the Observatory. In 1867, when he was thirty-three years of age, he became Professor of Astronomy in the Western University of Pennsylvania, in Pittsburgh. It was a double appointment, for he also had charge of the observatory in Allegheny City.

This observatory had begun well, for it had an excellent telescope; but a telescope is by no means the only thing that an observatory needs. To do

any work with it there must be various instruments, and there was not even a suitable clock. Worse than this there was no money to buy one. Then Professor Langley began to think. His seven years of business experience were not lost, and he thought quite as much like a business man as like a scientist. He concluded that he had a valuable article to sell. The only question was who would become its purchaser. That article was correct time, delivered regularly at the door. He made up his mind that railroads would be more interested in this than any one else. In those days there was no "standard time," and the custom of the railroads was to run on the local time of their terminal city until the train came within the "sphere of influence" of the next large city, then change to the local time of that city. It was a troublesome and unsafe system—or rather lack of system—for both railroads and travelers. Professor Langley did not find it difficult to persuade the Pennsylvania Railroad that to have standard time, given by signal from his observatory, would be an excellent thing for it. The railroad provided the equipment, and at a given moment each day the time was flashed from the observatory to every one of its stations.

A wide-awake scientist always has, besides the work in hand, problems in his mind which he is longing to solve. One of Langley's problems was how to measure the heat and light of the sun and how to learn their effect upon the earth. No instrument yet made was accurate enough for him,

and he invented one, which he called the bolometer. This measured heat within one millionth of a degree, and by it he proved that even a sun-spot makes our temperature a little cooler. He proved, too, that our devices for giving light — that is, candles, kerosene, gas, etc. — really use up much more than nine tenths of their power in making not light but heat. Nature can give light without heat, he declared, for she has made the firefly; and it is our business to find out how she does it.

Without any working for fame Professor Langley had become a famous man. He was one of the foremost authorities on the sun. He lectured before learned societies in this country and in Europe, and received medals and college degrees in generous numbers. He was happy in Pittsburgh, but he felt it a great loss not to be in close association with other scientists, and when an offer came from the Smithsonian Institution, in Washington, he accepted at once. One year later, in 1887, he became its Secretary.

This Institution was founded by the gift of an Englishman named James Smithson. He never saw America, and no one knows what suggested leaving his money to this country to found "an establishment for the increase and diffusion of knowlege among men," as he said in his will.

Professor, or rather Dr. Langley was now in his element. The Institution sends out parties to explore unknown parts of the world. It publishes accounts of these explorations and many valuable

scientific works. It offers rewards for original research, and exchanges reports and writings with other learned societies throughout the world.

The new Secretary was intensely interested in every branch of this work; but he was too thorough a scientist to be willing to give up his own special line of study. He continued his researches into the power of the sunlight; he made careful drawings of the surface of the sun; he studied its spots and its heat and its influence upon the earth. An astrophysical laboratory was founded, and here he had every advantage for research. "But what is the practical value of this work?" thoughtless people would question him; and he would reply, "All truth works for man if you give it time."

Another problem of this "all truth" that he was eager to solve was the old question of his boyhood, how birds, that were heavier than air, could fly through it. The books declared that the more rapidly anything moved, the more force was required. He was soon convinced that this could not be true in flying, for the fastest birds are not the strongest. He watched the buzzards. They float through the air without any flapping and with only an occasional slight tilt or change in the slant of their wings. He decided that a body can be sustained in the air by the pressure of moving air against extended surfaces; that is, the air presses against the under side of the birds' wings. The problem of flying was chiefly, then, to find out what kind of mechanism to use.

He made a table sixty feet in diameter whose top was whirled about rapidly by a small steam engine. To this table he fastened metal planes, set at varying angles, and sometimes a stuffed albatross or a frigate bird or a California condor, with extended wings, and calculated what power would be needed to hold up a certain weight when the plane of the bird was moving swiftly through the air. He discovered that instead of rapid horizontal motion through the air requiring more force than slow motion, the truth was that the more rapid the motion, the less force was needed for the same distance.

For nine years he experimented. He made model after model, forty or more in all. On May 6, 1896, his "aërodrome," or *air-traveler*, was sent off from a houseboat on the Potomac River. This was only a model. It had a little engine and gasoline tank, and weighed about twenty-four pounds. For one minute and twenty seconds it flew upward. Then, the steam being exhausted, it settled down slowly upon the water. It had made a flight and had kept its equilibrium perfectly. Alexander Graham Bell, who was present, declared that for the first time a heavier-than-air flying machine had by its own power maintained itself in the air for more than a few seconds. No one can doubt now that flying is possible, he said.

Langley had succeeded. He had discovered and revealed the law that made flying possible. He had proved its truth by his model. He had done

the work of a scientist, and he did not care to go any further. Two years later, however, he took a different view of the matter. This was in 1898, and it seemed probable that there would be war with Spain. Flying machines might, either then or in later wars, be of great service to his country. The officers of the army and the navy were interested, and the United States Government made an appropriation of fifty thousand dollars, to be used in developing a machine that could carry a man and serve as an engine of war.

Then Langley set to work again. No gasoline engines suited to his purpose were manufactured, so he made one for himself that was both light and powerful. When the summer of 1903 had come, he had two machines ready. One was a model; the other was large enough to carry an engineer. In August the little model was tested. A bit of carelessness on the part of the workmen prevented it from doing its best, but it flew and it maintained its equilibrium; and that was what was wanted.

The larger aërodrome was to be tested in October of the same year. By this time everybody knew that the great scientist, Secretary of the Smithsonian Institution, was trying to fly. The crowds thought that only a man whose brain was a bit touched would attempt such an impossibility. They laughed and joked about him, and when they found where the test was to be made, they swarmed about the place, making fun of the preparations, of the machine, and of its inventor.

Some one has said that if Dr. Langley had taken a hint from some fat hen flying over a fence, and had noticed how easily she rose straight from the ground, he would have realized that his machine could be made to rise from a level. Unluckily, he made the mistake of supposing that it must "get a start" from some power besides that of its own engine. He had therefore built a large houseboat on whose top were launching ways. The machine rested on a car, which was held back by heavy springs. At the releasing of these springs the car was to run forward on the ways bearing the aërodrome. The ways were then to drop, and the aërodrome was thus to be started for flight.

When the signal was given the springs were released and the car ran forward on the ways. The aërodrome rose a little; there was a whirring noise, then a roar; then straight into the Potomac River plunged "Langley's Folly." A guy post had caught in the launching car. How the crowd jeered! They did not know the difference between a success and a failure. The engineers and scientists present knew that what had failed was not the flying machine, but merely the launching ways, a very small matter. The machine itself had had no trial, but the headings of the newspapers proclaimed that it had failed. Two months later Langley tried once more; but this time too the launching apparatus did not work properly, and the rear end of the aërodrome was wrecked before it left the ways.

These failures of the arrangements for launching



THE FIRST SUCCESSFUL HEAVIER-THAN-AIR FLYING MACHINE

A photograph taken at the moment of launching Langley's aërodrome, May 6, 1896. The success of present-day aviation is due to Langley's pioneer work.

would to-day be looked upon as a trifle; but even experiments in ways take money, and there was no money forthcoming. Dr. Bell and Nikola Tesla and other scientific men declared that Langley had proved by his earlier models that if the launching

arrangements were properly controlled, the machine would be a success; but Congress had forgotten all about the earlier models, and would not make any further appropriations. People who thought themselves witty wrote silly rhymes and made stinging jests about "Langley's Folly."

The inventor was deeply wounded, but he knew that he had solved the problem of flight and he never doubted that his work would some day receive the honor that it deserved. "The world *must* realize," he said, "that the great universal highway overhead is soon to be opened."

Three years after the failure of the ways the inventor died. Aviation had progressed, and even then Langley's work was beginning to win appreciation. The Wright brothers had the advantage of a motor already developed which was light and easily controlled. They used Langley's calculations and declared frankly that his work was the inspiration of their early studies.

"Langley's Folly" was raised from the bed of the Potomac and hung for more than ten years in the National Museum as a curiosity. In 1914 Mr. Glenn Curtiss, with the permission of the Government, carried to Keuka Lake the old machine to which Langley had devoted so much of his best thought, gave it fresh canvas, new wires, and a new motor; then, with a crowd — this time a crowd of admirers — eagerly watching, he flew smoothly and safely, while the crowd cheered wildly.

The Smithsonian Institution put up a bronze

tablet in honor of the inventor of the first heavier-than-air flying machine that the world ever saw. Every one was ready now to give him praise and applause; but a little sympathy and encouragement when he was alive would have been better.

ANDREW CARNEGIE

THE MAN WHO WOULD NOT DIE RICH

1835–1919

1899, consolidation of Carnegie's steel interests into the Carnegie Steel Company

In Dunfermline, Scotland, there was once a weaver. He had a wife and two boys, he had four damask looms, he took apprentices, and he was looked upon as a well-to-do man. In the middle of the nineteenth century weaving was done on hand looms in men's own houses, but when the steam loom was invented it became harder and harder to get work, and one day the father returned from delivering some cloth and said sadly, "I have no more work."

Even "Andy," the boy of ten years, understood what that meant, and he went to bed a troubled and anxious little boy. The father and mother had a long talk. *They* could perhaps get on in some way, but what of their two sons? There seemed nothing in Scotland for them to look forward to; and they began to talk of America. Some relatives had gone to Pittsburgh, and had done well. They decided that for the sake of their boys they would leave the place that they loved and cross the ocean.

In Pittsburgh the father found work as a cotton weaver. "Andy," too, found work as a bobbin-boy. A proud boy he was, for his $1.20 a week was

a great help in supporting the family. The factory ran from sunrise till dark with forty minutes for dinner, pretty long hours for a child of his age, but he made no complaint. He must have shown that he could be trusted, for he soon ceased to be a bobbin-boy and was made engineer. The power for the factory came from a steam engine, and this small white-headed boy of thirteen was put in charge of it. It is no wonder that he dreamed of that engine, for even if it was not very large, it was quite capable of blowing up the factory if the boy manager aroused its wrath by neglecting it.

After he had spent a year in a dark cellar with only an engine for a companion, there was a discussion in the little Carnegie home. The boy's uncle had suggested that he try to get a position as telegraph messenger. To the end of his life he remembered putting on his little blue jacket and going to the telegraph office with his father. He was engaged. He was to receive $2.50 a week, and he was filled with pride and radiantly happy. Long years afterwards he wrote:

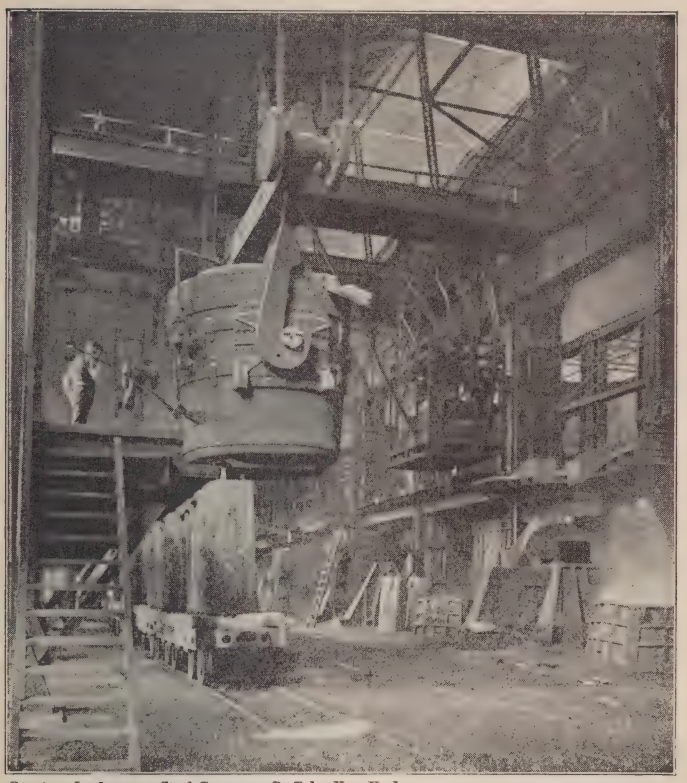
"Imagine what it is to be taken from a dark cellar, where I fired the boiler from morning until night, and dropped into an office, where light shone from all sides, with books, papers, and pencils in profusion around me; and oh, the tick of those mysterious instruments on the desk, annihilating space and conveying intelligence to the world. This was my first glimpse of paradise, and I walked on air."

To lose these joys of being a messenger boy would

be terrible, and he knew that in one respect he was not equal to the position; he did not know the business parts of the city. He knew how to learn them, however; and he set to work. Before long he could shut his eyes and say the names of the firms on both sides of the principal streets, and picture to himself the fronts of the buildings. Then there was no drawback to his happiness.

This young Andrew had the habit of doing everything as well as he could and of keeping his eyes open to see if there was something to be learned. There certainly was in this office, and before he had been there a month he went straight to the superintendent and asked if he would teach him to telegraph. The superintendent had taken a liking to the wide-awake boy and began to teach him. It was not long before he could telegraph as well as his instructor. Moreover, he could read by ear, which was not the custom in those days.

In this office any messenger boy who chose was allowed to practice on the instruments before office hours. One morning Andrew was hard at work when an important message was signaled. He was sure that he could manage it, and when the operator made his appearance there was the message carefully written out, waiting for him. It proved to be accurate, and the result was that the messenger boy became a telegraph operator with a salary of three hundred dollars a year. The increase was needed, for his father had died, and the young man must support the little home.



Courtesy Lackawana Steel Company, Buffalo, New York

IN A STEEL FOUNDRY

A boy who does his work well is always noticed. Mr. Thomas A. Scott, superintendent of the Pittsburgh Division of the Pennsylvania Railroad, was often in the telegraph office, and had seen the good work of young Carnegie. He offered him a position as operator for the railroad with ten dollars a month more salary.

There is a certain bit of wisdom with a whole gold mine of value in it: "Those who never do any more than they get paid for, never get paid for any more than they do." Young Carnegie always aimed at doing more than he was paid for. It was easy to find work here, for the Pennsylvania Railroad system lay open before him. He studied it and thought about it. The time came for him to use his knowledge and his thought. One morning before Mr. Scott had come to the office, a telegram reported the wreck of a fast express. This express had the right of way, and on the sidings all along the line were freight trains waiting for it to go by and leave the track clear. Carnegie telegraphed to the express that the freights would have the right of way for three hours and forty minutes. He knew where each freight train was, and he telegraphed to each to go ahead. When the superintendent came in everything was moving on. Before long Mr. Scott had a new private secretary, and his name was Carnegie. This was the beginning of running trains by telegraph, and the system was promptly adopted by all the single-track roads.

Before long Mr. Scott was moved up higher in the railroad service, and Carnegie took his place. The railroad management was thinking about bridges. Wooden ones sometimes broke down and sometimes caught fire, and an iron bridge was being tried. This succeeded, and Carnegie was convinced that a firm to manufacture the parts for iron bridges would be a success. With Mr. Scott's help and his own business ability he had invested his savings most ad-

vantageously, and he was ready to put what money he had into this new venture. Others joined with him. This was the beginning of the great United States Steel Company, which now owns not only an immense manufacturing plant, but coal lands, iron lands, gas lands, a fleet of lake steamers, a private telegraph system, and a private railroad.

Mr. Carnegie never forgot his own boyhood, and he was always on the lookout for young men to advance. He watched them closely, and gave them more and more responsibility. If they proved equal to it they were promoted and became partners. If they did not stand the test there was no hope for them in that establishment, not even for his own nephew. In the old stories of Robin Hood, Robin would have no man as a follower who could not beat him in a fair fight; and much after the fashion of Robin was Mr. Carnegie's attitude toward his young men. He had a genuine admiration for those who had proved worthy, and he said of them:

"I do not believe any one man can make a success of a business nowadays. I am sure I never could have done so without my partners, of whom I had thirty-two, the brightest and cleverest young fellows in the world. All were equal to each other, as the members of the Cabinet are equal. The chief must only be first among equals. I know that every one of my partners would have smiled at the idea of my being his superior, although the principal stockholder. The way they differed from me and beat me many a time was delightful to behold. I never en-

joyed anything more than to get a sound thrashing in an argument at the hands of these young geniuses. No man will make a great business who wants to do it all himself or to get all the credit for doing it."

When Mr. Carnegie was sixty-four he retired from business with an enormous fortune. He had often said that it was the duty of a rich man to live simply, to provide first for those who were dependent upon him, and to look upon the rest of his property as a trust, not to be held fast till the last minute of his life and then willed away merely because he could not hold it any longer, but given away while he lived. That sounded well, but would he live up to his theories, and could he? For his interest in the steel works he had received $250,000,000, and that is a big sum. His income from this was $34,000 a day. What should you do if a check for $34,000 was handed to you every morning with strict orders not to have a penny left at night?

What to do with part of it he had decided when he was a boy in Pittsburgh, receiving $2.50 a week. A kind-hearted gentleman in that city invited him and some other boys to come to his house every Saturday afternoon and select a book from his library to read through the week. "If I am ever a rich man I will found free libraries so that poor boys can have good books to read," he had said to himself at the time, and he had never changed his mind. He now set to work to give libraries.

He was as wise in his giving of money as he had been in making it. If a town asked for one of these

libraries, it must prove that it really wanted it by agreeing to devote a certain amount of money each year to its support. He spent at least $70,000,000 on these gifts, but he made no stipulations except what were necessary to secure the continuance of the libraries and the best use of the money. People speak of "Carnegie Libraries," but Mr. Carnegie himself never suggested or even hinted that they should be named for him.

About $30,000,000 he set apart for pensions or insurance for college professors. He established a benefit fund for the employees of the Carnegie Steel Company. He founded a Hero Fund in this country and in many of the countries of Europe to reward persons who had risked their lives to save others. Of war he had a profound horror, and he gave $10,000,000 as a fund the income from which is to be spent in any way that the directors think wise in order to bring about good-will among nations. He added to this gift $1,500,000 to build a "Peace Palace" at The Hague. To Scotch universities and to his native Dunfermline he gave liberally.

He felt that Pittsburgh had a special claim upon his interest, because it was there that he had made his fortune, and he wished to aid the city by transmuting this money into things that would give spiritual and intellectual gain. To Pittsburgh he gave the Carnegie Institute, consisting of library, concert hall, picture gallery, and museum. Later he added the Technical School, that the boys of Pittsburgh might receive their education in their home city.

The Carnegie Institution in Washington, which Mr. Carnegie gave and endowed with a gift of $22,000,000, has for its object investigation in all departments of science, literature, and art, for the improvement of mankind. The work of this Institution is much varied. One department is perhaps making original researches in astronomy, another in zoölogy, another is sending a ship of bronze over the seas. Corrections of the charts of the magnetic currents are made on these trips, corrections which will save many a brave vessel from being dashed on the rocks and wrecked.

In 1911, eight years before his death, Mr. Carnegie founded the Carnegie Corporation of New York, and put into the hands of the Corporation $125,000,000. In doing this he was planning that long after his own death his fortune should continue to serve the world. The trustees are left free to assist, if necessary, the institutes, Hero Fund, etc., which he had already founded, and also to promote the advancement and diffusion of knowledge in whatever ways may be found desirable. In his will he left to this Corporation all property not otherwise disposed of.

Andrew Carnegie gave away at least nineteen twentieths of his fortune, a larger sum than any one else in the world has ever given. Best of all, he gave himself, his thought and his careful planning for what would be of most value to the peace and progress of the whole world.

WILLIAM CRAWFORD GORGAS

WHO MADE THE CANAL ZONE SAFE

1854–1920

1904, appointed Chief Sanitation Officer of the Panama Canal

In some of our Southern States yellow fever used to break out every few years. Towns had to be quarantined, all business with them was completely stopped, and many persons died. This fever came from Cuba, and was caused, many people thought, by the filth of her cities. As long as Spain held the island nothing could be done; but when, at the close of the Spanish-American War in 1898, Cuba came under the care of the United States, our army set to work to clean house.

This business was put into the hands of Surgeon-Major Gorgas. He was born in Alabama, son of a West Point graduate, and had seen active service in Florida, Dakota, in what used to be Indian Territory, and on the Mexican Border of Texas. He was a gentle, courteous man of "old school manners," a man who never went away from a place without leaving many friends behind him. He now began to clean up Havana; and it *was* cleaned. It fairly shone with cleanliness. Apparently the enemy had been conquered. But the next thing was an epidemic of fever in the spotless city, and the most discouraging fact was that the very worst of the epidemic was in that part of the city which had been put into the best condition! What was to be done?

As early as 1881 Dr. Carlos Finlay, of Havana, suspected that mosquitoes had something to do with the spread of yellow fever, and the medical board of the army thought it was quite worth while to try some careful experiments and find out whether this was true. They found that it was; that fever was not given directly by one person to another, but through the bite of a mosquito that had previously bitten a sufferer. The thing to do, then, was to get rid of these mosquitoes, and Dr. Gorgas went to work. The result was that after a few months there was only one case of fever in Havana.

When a man has made a success of one piece of work he is usually honored by having a harder piece put into his hands, and Dr. Gorgas, promoted to be Colonel and Assistant Surgeon-General Gorgas, was now sent to Panama.

Panama was hot and wet. The Chagres River was, as some one said of the Concord River, "too lazy to keep itself clean," and moved so slowly that one could hardly tell which way it was flowing. There were swamps and morasses, steaming up hotly; there were quagmires and stagnant pools everywhere. In the towns of Colon and Panama matters were quite as bad as in the country. There was no "city water," and it was the custom to keep an uncovered rain-barrel just outside the door. In front of the door was usually an open and very bad-smelling ditch to carry off the foul water.

The Isthmus was a perfect paradise of mosquitoes, both those that spread yellow fever and those that

spread malaria. They had things all their own way out of doors, and as nobody used screens they flew into the houses as they liked. Of course all sorts of fever flourished, and occasionally there was an epidemic of yellow fever. The only marvel is that any one could live there. Indeed, very few persons did live there in any condition of health. Even if they escaped yellow fever they suffered from malaria. Both kinds of mosquitoes were ready to have a fine time infecting newcomers.

This was the place into which it was proposed to turn thousands of men, not only men from hot countries and negroes, who rarely take yellow fever, but men and their families from cool, clean homes in the North, just the people to be struck down by the disease.

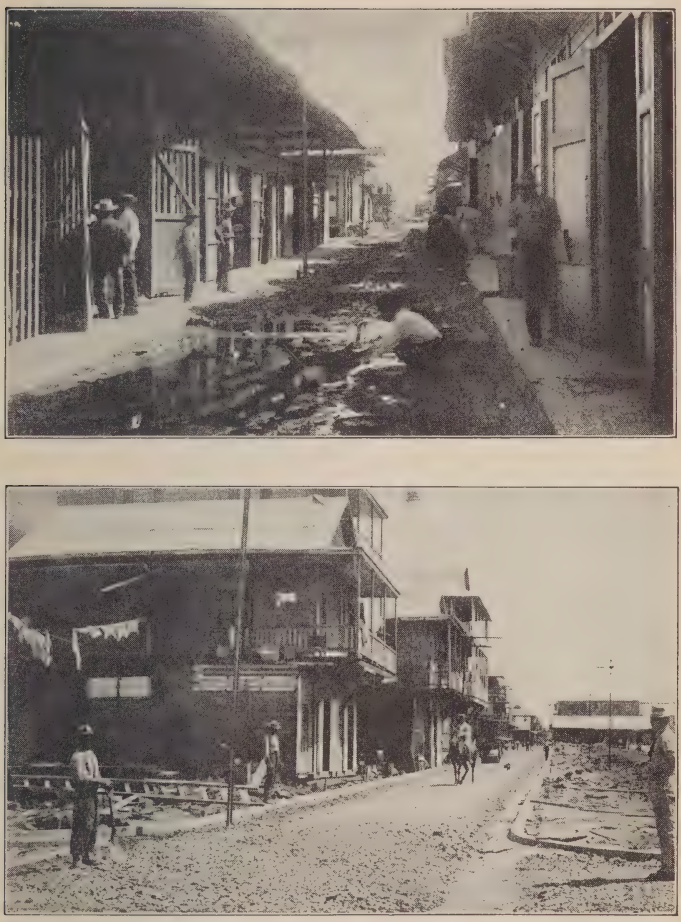
They came. Malaria spread and yellow fever increased. People began to laugh at the mosquito theory, scoffed at the sanitary commission, and asked that Gorgas be sent away and some one else appointed in his place. There was a general fright and a rush for the returning steamers. The whole trouble was that Colonel Gorgas could not get the supplies that he needed, and that it had not been fully decided what our legal rights were in the cities of Colon and Panama. Before long the supplies came, the legal tangle was straightened out, and sanitation began in earnest.

It was a big job. Here were many thousand men brought to work on the great canal. Well men were needed, not sick men. Sick men were useless and

expensive. When a man is sick not only must he be cared for, but a well man must take his place. Then, too, many men brought their families. It was Colonel Gorgas's business to see that, as far as possible, neither the men nor their families became ill. He must look out for the general health as well as for special diseases.

Good water was especially necessary, and he brought it in through great mains. This was not the work of a day, and while the system was being installed he established stations where pure drinking-water was supplied. The streets of the towns were paved and cleaned. The open ditches for foul water were filled up and sewage systems were installed. Before this the only collectors of garbage had been the vultures that swooped down for anything that they found eatable; but Dr. Gorgas insisted upon the use of covered garbage-cans, quite a new idea in Panama. Houses were examined, one by one, and the inmates were taught how to keep them sanitarily clean. Doors and windows were screened. Swinging shelves were put up, hung by oiled twine, so that food might be kept from ants and roaches. Bubonic plague is brought in by rats, or rather by the fleas that live on rats, and therefore, when it appeared on the Pacific Coast, Colonel Gorgas put himself at the head of a thriving business, paying ten cents for every rat tail brought him.

To prevent yellow fever just one thing was necessary, and that was to do away with the fever mosquito. It breeds in stagnant water, and therefore



Courtesy Isthmian Canal Commission

Before and after the Advent of the Americans

Of these photographs, the upper one illustrates the neglected condition of the streets of Colon when the Americans began to dig the canal. As a first step in sanitation all the streets were cleaned up and paved. The lower photograph shows the same locality with a macadam street in process of construction.

uncovered rain-barrels were no longer allowed to stand beside the doors. Swamps and pools were drained, and any morass that could not be drained was covered with a film of oil. Mosquito wrigglers come to the surface for air every few minutes, and if the surface is covered with oil they cannot push their breathing tubes through, and so they drown by the thousand.

Malaria is spread by the bite of another species of mosquito. This species never makes long flights, so General Gorgas had the brush cut away for one hundred yards around the houses. With no brush to shelter the insect the people were safe in their homes. Windows and doors were, of course, protected against both kinds of mosquitoes by well-made screens.

How was this done so thoroughly? In the first place, Colonel Gorgas was an excellent organizer, and he promptly divided the Canal Zone of about five hundred square miles into seventeen districts. Each district had an inspector, one assistant who knew mosquitoes as well as his *a*, *b*, *c;* another who understood all about making drains and ditches and oiling swamps; and a third who was able to take general charge of the workmen needed. The sanitary inspector reported at headquarters every day the number of malaria cases in his district. If in any one week this increased above one and one half per cent, there was a prompt investigation.

Second, a number of camps were established, where men needing an immediate operation or suf-

fering from an accident could be cared for without even the small delay of carrying them to the large hospitals at Colon or Panama. Every case of yellow fever was taken at once to the hospital, and there was so carefully screened that not one mosquito could get near him to spread the disease.

On paper all this seems smooth sailing, but in reality it was not an easy matter. Gorgas's chief difficulty was with the people who did not believe in mosquito infection because they could not see it. A large number of the workmen were ignorant Negroes from the West Indies. They themselves were immune from fever, and it was hard to persuade them that piles of dirt, stagnant water, and windows without screens would make trouble for other people. Colonel Gorgas found that the only way to manage them was to treat them like children. Just when the workman was not expecting a visit a Government inspector would appear at his door to inspect his house. If the rules had not been obeyed there was a fine to pay; and great pains were taken to make sure that the workman understood just what he had done that was wrong. If he was ill he was carried to a hospital; and before he was set free he was told simply and clearly what had caused his illness, and how he could take better care of himself. Before long one thing was perfectly clear in his mind, namely, that the only way to escape fines and penalties and hospital life was to obey rules and keep clean. In short, he now wanted to keep clean, because he had found out that if he did not

life was not comfortable, and he did like to be comfortable.

The second of Colonel Gorgas's troubles was the difficulty in getting Congress to understand that he was doing a big work and needed "big money" to carry it on. He had not torn down mountains or built locks. He had, to be sure, made the building of the canal possible by keeping many thousand people alive and well; but he could hardly march them before Congress and demand larger appropriations. He did his best to persuade Congress to give, then did his best with what Congress had given; and after a while his work found the appreciation that all good work does find sooner or later.

It was owing to Colonel Gorgas that the Canal Zone became a more healthful place to live in than the City of New York. While the French were at work on the Isthmus little was known of sanitation. They had an average force of 10,000 men; and lost in all 22,000. The Americans had an average force of 33,000, and lost 4000. It was proved by Colonel, or rather Brigadier-General Gorgas that the tropics could be made a safe place for even white men from the North, and throngs of the best workmen in the world, men who were as eager to give good work as to get good wages, came to Panama. Gorgas had attempted "the greatest task of sanitation that has ever been undertaken," and he had succeeded. Without his work the building of the Panama Canal would have been impossible.

ROBERT E. PEARY

DISCOVERER OF THE NORTH POLE

1856–1920

1909, reached the North Pole

When Robert E. Peary was three years old his widowed mother brought her boy back from Pennsylvania to her old home in Portland, Maine. Portland was a good place for a boy to grow up in. There were woods and fields and hills for Saturday rambles, there were bulwarks and forts, and best of all, there was beautiful Casco Bay, full of islands, the most fascinating spots in the world for a boy with a dory. Stretching far beyond the bay, far beyond the horizon line, was the real ocean, and the boy knew that if the dory had a sail and only went far enough to the eastward, it would carry him straight to Spain. Ships from Spain and France and even more distant countries often lay at the wharves. Longfellow, too, was a Portland boy, and he wrote of his beloved town:

"I remember the black wharves and the slips,
And the sea-tides tossing free;
And Spanish sailors with bearded lips,
And the beauty and mystery of the ships,
And the magic of the sea.
And the voice of that wayward song
Is singing and saying still:
'A boy's will is the wind's will,
And the thoughts of youth are long, long thoughts.'"

Whatever this boy's thoughts turned to, the chief thing that people seem to have remembered about him is that he was unusually thorough in anything that he undertook. He graduated at Bowdoin College second in a class of fifty-one and became a surveyor. Apparently he felt some attraction toward the navy, for he took a naval examination for admission as a civil engineer. Now he became a lieutenant, and before long he helped make the survey for the proposed canal across Nicaragua.

His connection with the navy led him to Washington, and while browsing one day in an old bookstore in that city he came upon a paper on the ice cap covering the interior of Greenland. It was interesting and led him to read more and more about the unknown country. He wanted to see Greenland, wanted it so much that in 1886 he applied for leave of absence and paid his first visit to the frozen North. He had only a short leave and a shallow purse, for he spent only his own savings; but he succeeded in getting into Greenland farther than any other explorer had done. The charm of the "great white North" was upon him, and he wanted to go again. The Philadelphia Academy of Natural Sciences thought he was well worth sending, and supplied part of the money.

Five years after his first trip he made a second, but not alone. Between the two trips he had married, and his wife had said: "I am young and well and strong, and I can live in Greenland as well as any Danish woman. Why should I not go with

you?" She went, and proved herself a most helpful companion. On this trip Peary began to make his mark on the map of the world, for he gave a northern coast-line to Greenland and proved that it was an island. He went as far north as 81° 37′.

Almost as soon as he and Mrs. Peary reached home they began to prepare for another trip. Part of the preparations consisted in Peary's giving 168 lectures to help raise funds. Mrs. Peary was ready to go again, this time to remain more than two years. The expedition came back enriched by a baby girl, for in the ice and snow of the North the little daughter of Lieutenant and Mrs. Peary was born.

The natives told Peary that once upon a time, many years ago, evil spirits had hurled down upon their country great masses of ironstone. Of course he guessed that these were meteorites, and he went to Cape York to see them. There were three, "the Tent," "the Woman," and "the Dog," as the Eskimos called them. The two smaller ones he brought home with him, and on a later voyage, he brought also "the Tent," which is thought to be the largest aërolite in the world. It is in the Museum of Natural History in New York.

But Peary's thoughts were on the Pole. One expedition after another had been made by gallant explorers, but all had failed to reach the Pole. Was there any hope that he could succeed? He knew just what the difficulties were, and he believed that he knew how to get the better of them. Instead of

trying to strike out in a "white man's way," he determined to follow the example of the Eskimos, to wear the same kind of clothing, to live in snow houses, and above all to "live on the country," for on much of the way north animals of various kinds can be found.

Again and again he tried. On his first polar expedition he remained in the North four years, trying every summer to get to the Pole, and every summer finding the way blocked by enormous ice packs, by dense fogs, and by terrible storms. He wrote in his journal: "My dream of sixteen years is ended. I cannot accomplish the impossible." But he could no more stop seeking for the Pole than he could stop breathing, and as soon as he reached home he began to make ready to "accomplish the impossible."

A vessel named the *Roosevelt* was provided, much stronger than any that he had used before. Everything went well to the very shores of the polar sea, and he marched farther north than any explorer had ever gone before. It is no wonder that he lay awake nights, wishing that the dogs had had their rest so they could start. Then came furious winds which broke up the ice fields. Peary and the parties that he had left on the way were separated, and they had the food for his return. To go on would mean dying of starvation, and he turned back — with the Pole less than three degrees away.

But could he go back? The savage winds were still raging. Almost under the feet of the explorers a "lead," or long opening in the ice, was formed. It

grew wider, until two miles of black water lay between them and their return. Day after day they waited; but when they had almost given up hope the black water showed a thin coating of ice. Even with their snowshoes on, it bent under their feet. They gained the other side, but not a moment too soon, for the changing wind tore open a crack just behind them.



Photograph by Brown Brothers

EXPLORER PEARY ON THE BRIDGE OF THE STEAMSHIP "ROOSEVELT"

Other explorers had been proud of reaching "farthest North," but with this explorer it was the Pole or nothing; and he was no sooner at home than he began to make ready for his eighth expedition. Arctic travel demands men who are strong and young. Peary was now fifty-two. This was his last chance.

Many of the men had been with him on some or all of the other expeditions. Everything was provided for safety and comfort that twenty-two years' experience of the North could suggest. Cranks without number urged him to try their amazing schemes. One thought a lengthy hose through

which soup could be sent to advance parties would be a valuable article. Another was more ambitious and recommended a machine of his own invention for shooting Peary himself straight to the Pole.

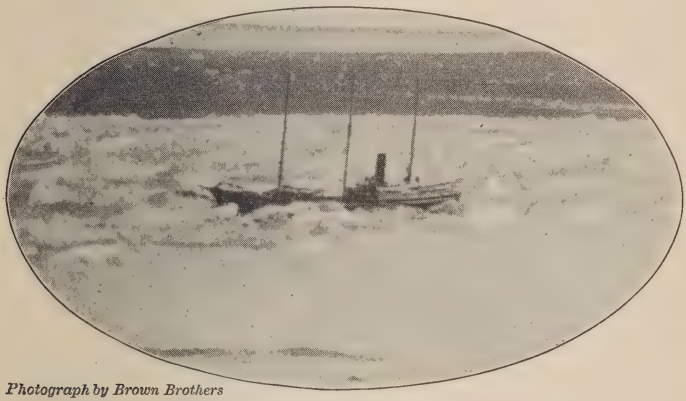
When the *Roosevelt* left New York, in 1908, the thousands of people on the piers cheered, the tugs and ferryboats tooted, the factories blew their whistles, President Roosevelt's *Mayflower* saluted with her one little gun, and the boat was off.

On they went, taking on coal at one place and Eskimos at another. The *Roosevelt* was caught in the ice and "kicked about by the floes as if she had been a football," but at last she was at Cape Sheridan, and in the "great dark" for the five months of winter. With the first light of spring they started for the Pole. It was four hundred and fifty miles away. No party could drag enough food and liquid fuel to last them there and back; and Peary had divided his force into a main party, and supporting parties who were to break the trail for the first three hundred miles in order to save the strength of the main party for the last dash. As fast as the food brought by a supporting party was used up, that party returned. This was perfectly planned, but they all knew that a twenty-four-hour gale or an open lead that refused to close would spoil everything and send them back in bitter disappointment.

The storm did not appear, but the leads did. These were crossed as best they could be. Peary said of one that it was like trying to cross a river on gigantic shingles, two or three deep. Another

opened among their snow huts, separating them from one another. There was nothing to do but wait for the ice to close — if it would. The wind changed, and they rushed across at full speed.

At length all the supporting parties had returned. Peary, his four Eskimos, and a Negro who had been with him on nearly all his expeditions set out on the last dash to the Pole. When they reached it, April



Photograph by Brown Brothers

THE STEAMSHIP "ROOSEVELT" FROZEN INTO THE ICE

Waiting for Peary's return from the North Pole.

6, 1909, he was too tired to realize anything except that he could not keep awake. Hour after hour he slept, and when he woke, he wrote in his journal: "The Pole at last! The prize of three centuries. My dream and goal for twenty years. Mine at last! I cannot bring myself to realize it. It all seems so simple and commonplace."

And yet he stood where no man had ever stood

before. North, east, and west had vanished, and there was only south. Time, too, had disappeared, for time is marked by the sun's crossing the meridians of longitude, and here all meridians were one. The Stars and Stripes was hoisted on ice lances in the brilliant sunlight. The World Flag of Liberty and Peace, the Navy League Flag, the Red Cross Flag, and the flag of Peary's college fraternity, the Delta Kappa Epsilon, were flung to the Arctic breeze. Observations were taken, and after thirty hours at the Pole the explorers gave one last look and set about the return.

At the next full moon the ice would be full of leads, and, as Peary told his men, the journey must be "big travel, small sleep, and hustle every minute." So it was, but all went well, so well that one of the Eskimos said in his own language, "The Devil is asleep or having trouble with his wife, or we should never have come back so easily."

In the early days of autumn, 1909, the *Roosevelt* reached the wireless station at Indian Harbor, in Labrador, and soon Mrs. Peary was reading a message: "Have made good at last. I have the Pole. Am well. Love." To the Associated Press went the words, "Stars and Stripes nailed to the North Pole."

As the sturdy little vessel drew near to Cape Breton Island a dainty white yacht steamed out to meet it. On board were Mrs. Peary and the two children. The whole bay was full of boats in their gayest bunting, and from them came cheer after

cheer for the man who had succeeded. The *Roosevelt* steamed away to New York, but Peary and his family went to their summer home on Eagle Island, in the waters of beautiful Casco Bay.

Congress made Peary a rear admiral and passed a formal act of thanks for his achievements. France gave him her highest honors, and as for medals and honorary degrees, colleges and learned societies in different countries showered them upon him like hailstones.

"What wilt thou have?" says Emerson. "Pay for it and take it." Peary had aimed at the Pole. He had paid for it well, for he had given twenty-three years of his life to the quest; but he had won.

GEORGE WASHINGTON GOETHALS

BUILDER OF THE PANAMA CANAL

1858–1928

1916, the Panama Canal opened to commerce

I WONDER how many children, when they first looked at the map of the Western Hemisphere, have said to themselves, "How easy it would be to cut those two continents apart!" Many a man has wished that this had been done, especially after gold was discovered in California, and thousands of "forty-niners" from all over the world set out in a mad search for the treasure. Those who crossed Panama escaped the long voyage of nearly eight thousand nautical miles around South America; but they had to paddle up the Chagres River, ride on muleback or in chairs carried by Negroes or Indians the rest of the way, spend four days in going forty miles, and then wait on the Pacific side until it pleased some vessel to come along and carry them to the land of their dreams. How easy it would have been if only a canal had been dug across the Isthmus and they could have sailed directly through!

In more than one country people began to take down their atlases and look up Panama; and as the years passed the French did this more than others because a Frenchman, Ferdinand de Lesseps, had just made a success of digging a canal across the Isthmus of Suez. They were very proud of his

achievements, and when he proposed digging a second canal, across Panama, they were so sure of another success that they could hardly bring out their savings fast enough.

In 1881 the canal was begun by a company whose head was De Lesseps. In so new an undertaking mistakes were of course made. Digging a canal at Panama was a very different matter from digging one at Suez, where there were no rocks and the soil was only sand and clay. No one knew that mosquitoes spread yellow fever. Indeed, in 1881, people thought little of preventing disease; it was enough if an attempt was made to cure it. There was utter recklessness of expense, and vast quantities of costly machinery were ordered that could not be used. Enormous salaries were paid. De Lesseps was an honest man, but unfortunately the chief interest of many of his associates lay in filling their own pockets. Then, too, every question of legality had to be brought before the somewhat unfriendly courts of Colombia, which was a frequent cause of delay.

In spite of all these drawbacks the French did a great deal of excellent work, but it cost enormously. In 1887 only two fifths of the work was done, and far more money had been spent than the original estimate for the whole had called for. A year later the company had to go into the hands of a receiver.

In 1904 the United States paid the French $40,000,000 for their maps and surveys, for the digging that they had done, for their stock in the railroad

that had been built across the Isthmus, and for their machinery, their buildings, materials, passenger and freight cars, locomotives, tools, etc., much of it in first-rate order. Then work began. It was not quite the kind of work that was expected, for while we were clamoring for the digging to go on, medical men under General Gorgas were doing something far more important; they were putting the place into such condition that a man could go there and dig without dying of yellow fever or malaria.

When the United States cleaned up Cuba it was found out that a certain kind of mosquito carries the fever from sick persons to well ones; and at Panama a fierce battle was going on against that mosquito. Swamps in which it bred were filled up or petroleum was poured upon the water; sewers were made; streets were paved and kept clean; houses and cisterns were screened; and just as soon as possible pure water was brought into Panama and Colon. The mosquito that brings malaria is more difficult to get rid of, but this too was in great degree destroyed.

In 1907 it was decided to put the work of building the canal into the hands of an army engineer. The one chosen was George Washington Goethals. He had begun life as an errand boy in New York, had succeeded in getting into West Point, had graduated as second in a class of fifty-four, and by this rank had won a place in the Corps of Engineers. Then he was set to work. He developed irrigation ditches in the West; he constructed bridges; he built dikes

to keep the Ohio River from mischief in time of flood; he built locks and dams on the Tennessee River, and coast fortifications at Narragansett Bay; he taught military engineering at West Point. He was deeply interested in every phase of this service, but he did sometimes regret that he was never allowed to complete any piece of work. Just as soon as it was in such condition that some one else could manage it, Goethals was sent off to another job. This was complimentary, but it is no wonder that he sometimes tried to fancy how it would seem to finish anything.

He had a job now that he was not only allowed, but commanded, to finish. He went to Panama, but he was not at all welcome. The men invited him to a smoker, but even there it was made plain to him that they did not wish to be under army rule. "If you see the men suddenly dropping their work," said the toastmaster, "standing erect with heels together and little fingers at the seams of their trousers, don't infer that they are crazy; they are only practicing the military salute." Then Colonel Goethals made a speech. "The army is not in charge of this business," he said, "and there is to be no saluting, no militarism. My only command is the Army of Panama. We are fighting Nature to dig a canal; and when the canal is done that will be our victory."

The work went on. Machine drills, rumbles and roars like thunder-storms and earthquakes, explosions, half a mountain flung one side, hailstones

of rock, showers of mud, dirt trains, steam shovels, men running to escape rocks from a blast, hurly-burly and confusion everywhere — this was what a first sight of Panama revealed. And then, as you looked longer, you saw that there was nothing but the most perfect order, everything in its place, every man knowing his work and doing it, and every act part of the great warfare of the Army of Panama in its struggle with Nature. Here and there the flash of a yellow car was seen. This belonged to the commander of the Army. The men called it the "Yellow Peril," and perilous its coming often was if a man was failing in his work. "The Colonel sleeps from ten to five," said one of the men; "the rest of the time he is working."

It was soon clear that Goethals's orders meant something. He was friendly with the men, and there was no "saluting," but when he gave an order it had to be obeyed, and no excuses would be accepted. He once sent to an official some unwelcome instructions, and the official began a complaint with, "I got that letter of yours, Colonel—" "I beg your pardon," said the Colonel pleasantly, "but you mean that you received my orders. As you have the orders that matter is settled. Was there anything else you wished to talk about?" There was not.

Besides engineering the digging of the mammoth canal Goethals had 65,000 men, women, and children under his government, and part of his work was to see that they were treated justly and were

made contented and happy. He told the men in his first speech at the smoker that if they wished to complain of anything or to make any suggestions, they were free to come to him at any time or to detain him as he went about the works. This was the beginning of his "Sunday court."

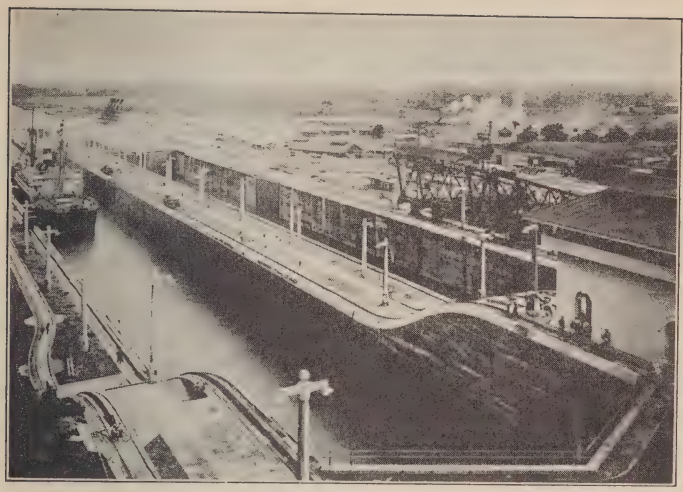
To this "court" came people of many nationalities and with all sorts of grievances. Sometimes grave questions were presented, such as discord between husband and wife. In the United States these cases would often have been dragged through a divorce court, but on the Isthmus they were almost invariably settled in accordance with the advice of the commander-in-chief. Many of the questions were less important. One man thought he ought to have more pay. Another, who was on night work, complained that the noise made by his neighbor's visitors prevented him from sleeping by day. The greatest trouble, Goethals declared, came from the housing question, for some houses were larger than others. After a while it was decided to assign quarters strictly according to the salaries paid. But furniture was also provided by the Government, and if one woman found that there was an extra rocking-chair in the house of a man with the same salary as her husband, then there was trouble. If a neighbor's children were annoying or a debt could not be collected, there was trouble. If the meat furnished to one house was tender and that furnished to another house was tough, there was trouble. Most engineers with the Panama Canal on their hands

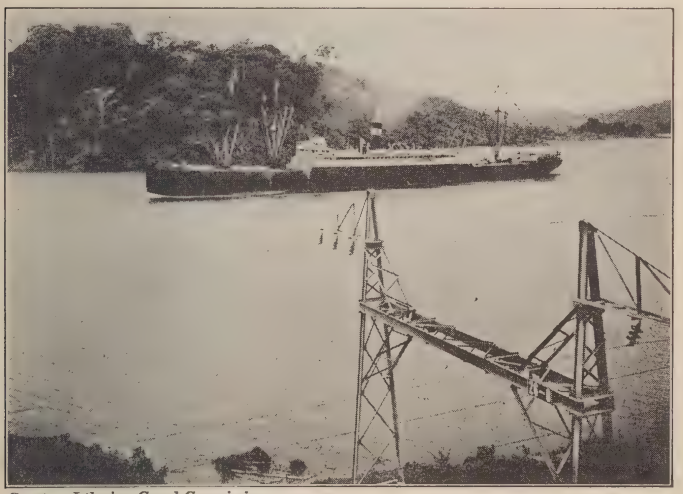
would have thought such matters too petty to be given the least attention; but Colonel Goethals was big enough to understand how things seemed to other people. He knew that these annoyances, small as they might appear to others, were really of importance to the daily comfort of those who complained, and he knew that people who were not comfortable would not remain on the Isthmus. It is no wonder that the men used to sing a little song whose chorus was:

> "See Colonel Goethals, tell Colonel Goethals,
> It's the only right and proper thing to do.
> Just write a letter, or even better,
> Arrange a little Sunday interview."

President Roosevelt was deeply interested in the canal. He knew that 65,000 men, many of them away from their families, were in absolute need of good clean amusements; therefore he had club-houses built and put into the charge of the Y.M.C.A. Here were libraries, pianos, reading-rooms, and games. The women had clubs of their own, but they were also admitted to these, and at certain hours children had the use of the rooms. Even the "movies" came to Panama. Out-of-door games were encouraged. Tennis, baseball, and basket-ball flourished, and there was as keen rivalry between clubs in Panama as between colleges in the United States.

Colonel Goethals carried this same friendly rivalry into the digging. He divided the canal into three parts, Atlantic, Central, and Pacific. Then began





Courtesy Isthmian Canal Commission

The Opening of the Panama Canal, August 15, 1914

Upper: Steamship "Ancon" in the West Chamber, Gatun Middle Locks. Lower: Steamship "Ancon" on Gatun Lake. These two pictures give a little idea of the trolley system used in towing vessels through the locks and the narrower parts of the Canal. Ships proceed under their own power only where they have ample sea-room.

most zealous team-work, for each division wanted the best record. This engineer certainly understood how to manage men. He realized that no man could be expected to feel much enthusiasm about the work when he knew nothing of it except the special part in which he himself was engaged; so a weekly paper was published. Then the men knew what was going on. They knew which steam shovel and which dredge was doing the best work, and they began to feel a professional pride in "our dredge," and "our concrete mixer." Then, too, they and our whole country had a chance to know week by week just what the canal was costing. We could see what the millions spent at Panama were doing. We could see that nothing was being hidden from us; and like the workmen, we began to feel more strongly than ever that it was "our" undertaking.

There was no graft, because Goethals would permit none. Of course it was tried more than once. Materials not quite up to the contract were sometimes sent, the guilty firm supposing that "the Government would never find it out." Unluckily for their pockets the man who represented the Government did find it out, and he refused to accept anything not of the best quality. Food had to be brought from the United States, and once, when some arrived that was not entirely above suspicion, Goethals promptly sent the whole cargo back. Indeed, the building of the canal was "the biggest, cleanest job the world has ever seen."

Early in 1914 the Isthmian Canal Commission

came to an end, and Colonel Goethals was appointed "Governor of the Panama Canal." Six months later the first ocean-going ship went through the canal. The Colonel was not on board entertaining the invited guests, but "on the job," for he was in the "Yellow Peril" on shore, keeping close watch of the vessel's progress. Early in 1915 he was made major-general.

Long before this Goethals had given warning that earth slides were to be expected, and would occur until the soil had had time to settle into a permanent position. Toward the end of 1915 there were two slides, from hills which stood opposite each other, with only the canal between. The channel was filled up, and there was nothing to do but to keep the dredges at work and delay the opening of the canal to commerce until April, 1916.

General Goethals took no credit to himself for his admirable work. He was a soldier, he had been ordered to build the canal, and he had obeyed; that was all. He had been commander-in-chief, he admitted, but every man who worked on the canal had shared in the labor and the glory. One of the finest traits of his character was this readiness to give credit to others and not try to keep it all for himself, and when the National Geographic Society gave him a medal, he said, "I accept it in the name of every member of the canal army."

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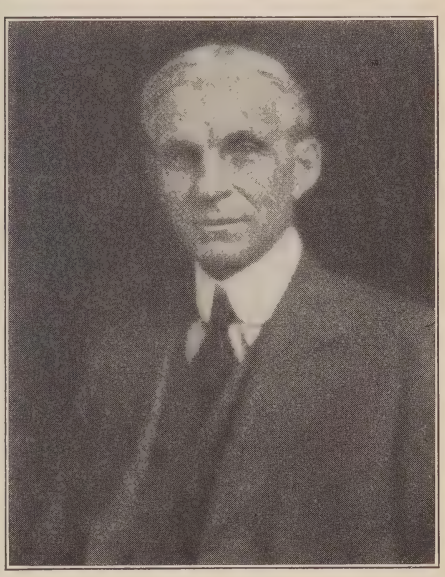
INVENTOR AND MANUFACTURER
1863–

ONCE upon a time a boy lived on a farm near Detroit. He was not a very big boy because he was only twelve years old, but he had some big thoughts. One of them was that there seemed to be a great waste of work and strength on their farm and on every other one that he had ever seen. For instance, why should a man carry water by the bucketful all his life when the laying of a few pipes would send the water to the place desired? Why should any one risk his life on a broken ladder when a new one could be bought at so small a price?

Now it is not at all uncommon for a boy on a farm to think that the work is harder than it need be, but it is a little unusual for a boy to plan how, in one way or another, the work may be made easier. But even the best workmen cannot work without tools, and tools were not hanging on every blackberry bush. This boy made use of everything that he could find — bits of metal, a pair of wheels, an old chain, washers, nuts; anything and everything that could be made to do anything was a tool and a treasure. Any bit of machinery was a jewel beyond price.

When he was twelve years old, he started one morning with his father to drive to Detroit. Just

ahead of the farm wagon stood a vehicle drawn up at the side of the road, waiting for them to pass. It was a portable engine and boiler mounted on wheels and trailing a water tank and coal cart behind. So far there was nothing new about it; the boy had often seen such vehicles. He thought he could easily make one if he had the materials and tools. But there was something else that caught his eye. There was a chain that connected the engine with the rear wheels. It was not many seconds before the boy was out of his father's wagon and asking questions by the score of the driver of the road engine. The boy was bright and the driver was interested in his new machine. Whether the man was in a hurry or not, he could not go on without answering the questions. The boy went home with his mind full of the new idea. A wagon could be made, a wagon that would travel on the highways under its own power. This was the be-



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ginning of Henry Ford's quest of the automobile, and was the great event of his early boyhood.

Watches as well as wagons were things that greatly interested him. He worked on every watch that came into his hands until he made it run. To persuade it to keep good time was sometimes quite another matter, but one year after the delight of meeting the road engine he succeeded at last in making a watch that ran perfectly.

He was seventeen years old now. He left school, much to the disapproval of his friends, and served an apprenticeship in a machine shop. By this time he was well acquainted with watches and all their freaks, and he increased his small income by repairing and caring for them. At one time he had three hundred under his charge. He also repaired jewelry; but this was dull work compared with work on freaky timepieces. He figured it out that he could make watches in large quantities for thirty cents apiece. Then came the change of time from sun time to railroad time. That was somewhat of an annoyance to the young mechanic, and he made for himself a watch with two faces, one for the man who stayed at home, and one for the man who took the train.

By this time other people were also at work on "horseless carriages," none of them very different from the one that the small boy had seen when on his way to Detroit. These were good as far as they went, but they were too heavy and they cost too much. What young Ford wanted was an engine

that would do the hard work of the farm, not too heavy to move nor too dear for the men of moderate income. Steam was tried as a motive power, but that was dangerous. In England a "silent gas engine" had been introduced; but this was too heavy and used illuminating gas for power. Moreover, such engines could not be used on American roads, which were at that time in anything but good condition. Possibly an engine might be run by vaporized gasoline; not quite a new idea, but one that had never been worked out; then, too, the experts had agreed that gasoline had limitations that would make its use impracticable.

Then came the marriage of the young machinist to a woman who believed in him and his ability. On the old farm he built a little story-and-a-half cottage which was comfortable and pleasant. There they lived for some time, giving the inventor an opportunity to carry on further experiments. Later he returned to Detroit, and became engineer and machinist in an electric company at forty-five dollars a month; that is, he gave the company his days, but his nights went to his own experimenting. As for his wife, she was as happy and as certain of success as her husband. "It was a very great thing to have my wife even more confident than I," said the inventor. "She has always been that way."

The young man had before this made a "gas buggy" that would go, but for some time his achievement was frequently a source of annoyance. It is hard to realize that only a few years ago people

used to stop — sometimes in the middle of the street — to stare at the amazing invention. Horses did not stop, but they did run. If the little car was left standing for a moment, some adventurous spirit would try to drive it.

Finally, the inventor had to chain it to a lamp post whenever he left it, as if it was some dangerous wild beast. Its maker had to get a special license to drive it in the streets, and was for some time the only licensed chauffeur in the country.

In the career of every successful man nearly always there comes a time when he realizes that he cannot follow the crowd or sometimes even the advice of his best and wisest friends, but must do as seems best and wisest to himself, a time when he must follow the belief that is in him.

Mr. Ford had now been with the Detroit Edison Electric Company for a number of years. He had spent his money experimenting on automobiles. He had nothing left but an idea; but when the company offered him the position of general superintendent, provided he would give up his work on the automobile and devote himself to "something really worth while," neither he nor his wife hesitated a moment in their choice of the car.

Strangely enough, few people seemed to take the automobile as a serious-minded practical member of society. Even when they realized that it had come to stay, most persons looked upon it as a toy, an amusing toy if you chose, but still a toy, and the best automobile was the one that ran fastest. Then

Mr. Ford made a racer that won the day at Detroit, and after that another that won the day at Palm Beach. Plainly the little Ford car could race, and everybody was ready to invest his money in its manufacture. Capitalists were eager to put in their capital, but they wished to control it. Ford wanted to manufacture simple cars for the millions, not traveling palaces for the millionaires. Backers there were in abundance, but they all had the same ambitions, to increase the luxury of their cars and to make money.

Now from the very beginning the inventor had had it in his mind to make what he called the "universal car." He had watched carefully to learn what the public wanted and what was best in material and method of building to produce that result. In one way and another he had learned just what he wanted, but it was not always attainable. In 1905 a French racer was wrecked at Palm Beach. Mr. Ford picked up from the wreckage a tiny bit of steel which he found to be remarkably light and strong and to contain vanidium. A man was brought from England who understood its manufacture; but it required a temperature of 3000° Fahrenheit, while our furnaces did not go beyond 2700°. Mr. Ford went to a small steel company in Ohio and offered to be responsible for all damages if they would try the 3000° of heat required. The first trial was a failure, the second a success. Then some steel in each part of the Ford car was tested scientifically, and that which was best adapted to each of the various parts was chosen for that part.

Mr. Ford now, with two or three men who thought as he did, hired a shed and set to work to make his boyhood dream a reality.

He not only made a new car, but he did much to revolutionize several doubtful mercantile practices of the day. At that time the general feeling was that a salesman had accomplished all that could be asked of him when the customer had driven away with his new car and the customer's check was safely put away in the salesman's pocket. Henry Ford, Marshall Field, John Wanamaker — all men who have succeeded in buying and selling — have come to realize that a sale is not a sale unless the customer is satisfied with it.

Ford's ideas went beyond that. According to his belief, the man who bought a car was entitled to a car that would continue running. If it failed, it was the business of the seller to see that it was put into shape. The result of this was that as soon as possible the country was sprinkled with Ford's service stations.

Another idea was to give up the common custom of "charging all that the traffic would bear," and begin at the other end; that is, find what it costs to manufacture the article in hand, then study to reduce this cost. To charge all that a buyer can be induced to pay is to make a sale not so much a simple honest business transaction as it is a battle of wits.

Another respect in which the Ford Company has always been particular is in the selection of its

salesmen. The man who represents the Ford Company must have a clean, attractive, dignified office, and good mechanics for making repairs.

What Mr. Ford's later years have been is known to every one. With friends, family, a beautiful home, fascinating work, and a son to continue it, he could hardly help being a happy man even without his millions. But the millions enable him to look into the future, to plan for thousands of boys to be helped and educated and made manly.

One of Henry Ford's most enviable qualities is his ability to enjoy small things. Everybody knows of his having bought the Wayside Inn, made famous by Longfellow's poem. Trees and flowers beautify the place. In winter the ice on a pond is carefully swept so that the owner and his guests may enjoy their old sport of skating. The house is filled with antique furnishings of all kinds.

To carry out the idea of a simple country life, the water of a fascinating old water mill slips over the wheel and splashes upon the rocks below. A little way from the mill, at the edge of the forest, stands a "replica" of the country schoolhouse of a century or more ago guarded by a real lamb that roams about in the field adjoining the schoolhouse — "Mary's little lamb," or one sufficiently like it to suit the verses. Shelves of old schoolbooks add to the antiquity, and a gentle, courteous lady, who harmonizes with the picture, meets guests with a word of welcome. People crowd into the little desks and listen to the story of the writing of the verses which

this lady tells so simply and charmingly. This is one of Henry Ford's recreations, and the man is fortunate who can find so much pleasure in simple ways.

Mr. Ford's mind seems capable of being turned in any direction, and of enjoying any pursuit. An aim more serious than that of restoring Mary's schoolhouse is to give an education to boys who without his help would be friendless in the world—an education that will enable them to support themselves when they leave the school. He has expressed his interest in brick and stone and the salaries of instructors to carry out his ideas. He takes boys who would otherwise have no chance to learn a trade or even to go to school. Some are sons of his former workmen, others are the children of widows, but there are many among them who are simply boys in need of a friend to help them to help themselves.

One of the most interesting parts of "Ford's University," as it is called in a friendly way, is the Trade School for boys from twelve to fifteen. Mr. Ford has very definite ideas of education. He wants his pupils first of all to handle real things and then turn to "book knowledge" of these things; first the hand, then the head. Therefore, the boy is given tools and taught how to make various useful articles, and he can hardly help developing a wish to know more about them. After two weeks in the workshop, he goes into a school for one week to take up "book and paper" work, so skillfully arranged to

connect with his shop work that he learns twice as much as he would in the same time if he had not had the shop teaching first.

From the start the boys are wage-earners. Each boy receives a small weekly wage, and more as he is able to earn it. He is given a monthly allowance for a savings account. He has also a hot lunch. He learns everything from the practical side, and classroom work is thrilling. After a time, he will perhaps learn to paint a Ford car. He is learning something of interest all the time, something that he wants to know, something that will increase his learning power. He has a chance to make discoveries, to go to college, or to the naval school if his heart is set upon it. The school is young, but it has already "made good." This is one of Henry Ford's favorite undertakings, perhaps the greatest of all.

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